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When the target comes within the field of the telescope, a bomb is released, and it falls upon the target, describing a parabolic curve due to gravity and velocity of the aeroplane.

DROPPING BOMBS FROM FLYING MACHINES.—[See page 388.]

# SCIENTIFIC AMERICAN

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*The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.*


## The Spirit of the Coliseum

A CERTAIN number among the multitudes that poured into the Coliseum in the days of ancient Rome were drawn thither solely by the true sporting instinct, which delights in witnessing feats of skill and endurance. The large majority went to witness the spilling of blood; for even the noble Roman matrons, we are told, in response to the inquiring glance of the victorious gladiator, would turn their thumbs down, indicating that they wished to see the life blood of the vanquished redden the sands of the arena.

Can it be possible that a touch of the savage desire to look upon mangled bodies and hear the sob of expiring life, which slumbered beneath the superficial civilization of the Roman people, is responsible for the vast crowds which gather at our modern race tracks to witness the criminally dangerous automobile race, or watch the aviator straining for a fall with Death, a thousand feet in midair?

There was a time when the automobile race, run over the highways of the country, possessed a distinct scientific and technical value. The supreme test of the strength and endurance of materials which was afforded by those contests, was one of the most valuable factors in bringing the automobile to its present perfection; and the brave fellows who lost their lives may be considered as having been sacrificed in a just cause, since they rendered possible the rapid advancement of a new means of transportation—possibly the most valuable that was ever introduced.

To-day, however, any legitimate reason for the holding of automobile races, particularly on dangerous race tracks, has disappeared. That such races, in spite of their frequent and frightful fatalities, continue to be held is to be explained by the co-operation of what Mr. Roosevelt has recently denominated as "commercialism and hysteria." If the possibilities of sudden death or horrible wounding were eliminated from these exhibitions, we venture to say that the promoters who trade on this morbid taste on the part of the public would quickly find that such exhibitions were altogether unprofitable. The element of novelty has long ago passed from such contests. Every one knows that if 200 horse-power is crammed into a racing automobile the machine will skid around an ordinary race track at a speed of something under 50 seconds to the mile; and every one knows also that a crowd of twenty to thirty high-powered racing machines will average on a specially-prepared track over seventy miles an hour. Should the time ever come when tires no longer burst, nor steering gears give way, nor roaring monsters go hurtling through a crowded mass of humanity at the rail, we venture to say that automobile racing as a sport will be as dead as croquet or shuttlecock and battledore.

The same argument holds as regards many of the so-called aviation meets. Continuous flying around a circular or oval course is monotonous. The public demands the spectacular in the form of "dives," "spirals," and other aerial gymnastics that are performed at imminent peril to life and limb. How often during the past year has the unfortunate aviator launched himself into the air under atmospheric conditions which he knew to be more than perilous—being driven to it by the jeers of a crowded grand stand and the importunities or threats of a professional promoter or the "local committee" of a bill-placarded and expectant city. The death of an aviator under such conditions comes very near to being homicide of the most atrocious character.

Let it be understood that the SCIENTIFIC AMERICAN is now speaking of so-called "aeroplane meets" which are exploited purely for commercial gain. Such gatherings as were held last year at Belmont Park, in which the pick of the aviators of the world contested, and where everything that could be done was done to satisfy the public and at the same time safeguard the contesting aviators, fulfill a useful purpose. They encourage the art as the automobile contests of eight to ten years ago served to develop the automobile and build up a great industry. Of even greater value are well-organized cross-country races. We venture to say that the art of aviation receives more stimulus from such a flight as that of Atwood from St. Louis to New York, or the present remarkable and so far successful attempt of Rodgers to fly from the Atlantic to the Pacific, than it does from a whole season of the present irresponsible aeroplane exhibitions, with their shocking list of fatalities.

## The Scrap Heap

ONE of the most marked distinctions between American and European practice in the technical arts is the free use (amounting in foreign eyes to positive extravagance) which we make of the scrap heap. Possibly the difference is due to the much greater cost of labor in this country; but whatever the cause, the fact remains that whereas in Europe there is a tendency to repair, rebuild or even largely re-design existing machinery, in the effort to keep it upon its legs as long as possible, here in America it frequently happens that a comparatively recent installation of costly machinery will be torn out and sent to the junk pile, to make way for an entirely new plant embodying the latest improvements.

We do not have to go far to find cases in point. Many of us will recollect the pride with which it was stated in the English press a few years ago that such and such a locomotive had recently left the railroad shops, after a thorough overhaul, and was again in service, with a record of Heaven knows how many decades of continuous service behind it, during which it had covered some millions of miles of track. Now to American eyes, although such a fact speaks volumes for the well-known excellence of British workmanship, the mere existence of a forty or fifty-year-old engine in service indicates that conservatism is being carried too far, and that English railroad methods lack that flexibility which is necessary for the best results. Perhaps the value of the scrap heap has never been shown to better effect than among American railroads and in those vast industrial plants and organizations which are covered by the steel trade. Where one enormous locomotive can be made to do the work of two, our railroad men never hesitate to discard the smaller in favor of the bigger unit; and instances have not been wanting where, in the manufacture of steel, a vast and costly plant has been "scrapped" to make way for some improved machinery, which, by virtue of its reduction of labor costs and general speeding up of the process, gave sure promise of not only paying for the discarded plant, but producing the manufactured product at a lower cost.

It is agreeably to this policy that certain older ships of our navy are put up for auction, or towed into shallow water, as was the old "Texas," to serve as targets for rifle practice. We regret to note that not a few people have criticised the destruction of the "Texas" as a piece of wanton extravagance. As a matter of fact, this obsolete vessel is giving far more value to the navy as a target than she ever did during the palmiest days of her commission. The battleship or cruiser which has been "outbuilt" by the rapid march of improvement in naval material is more profitable as old junk than as lying in reserve at a navy yard. The money spent upon these ships in the endeavor to modernize them might just as well be poured into the sea. One dollar put into absolutely new construction is worth a million spent in tinkering up obsolete ships.

As with the ships, so with the navy yards. The last report of the Secretary of the Navy tells us that we have several old yards which have outlived their usefulness and constitute a charge upon the country for which it gets practically no return. The policy of the scrap heap should be applied here with an unsparing hand.

New Orleans yard, to which no large ship of our navy could be sent in war time, for fear of its being blocked in at the passes; Port Royal and Charleston, both absolutely useless for battleships because their channels are silted up with sand and mud; New London, barred from the sea by a railroad bridge—these and others should be scrapped and abandoned. The maintenance of these lesser and useless yards from motives of sentiment or politics is working decided harm to the interests of the navy at large by the diversion of money, time and attention from those fundamental objects at which the present enlightened policy is aimed.

## The Status of Agricultural Meteorology

THE French Chamber of Deputies, at its session of December 22nd, 1910, passed a resolution calling upon the Ministry of Agriculture to undertake the development of work in agricultural meteorology—already carried on to a limited extent by the Department of Agricultural Hydraulics—and to take steps with a view to providing in the budget of 1912 for the organization of a special service devoted to this subject. By an order of April 10th, 1911, a committee of sixty-four members, having at its head M. Violle, of the Institut de France, was organized under the direction of the Ministry of Agriculture to prepare plans for the proposed service. At the same time the French government sought the advice of organizations in other countries engaged in this class of work, including the United States Department of Agriculture. Apparently the new service is to be independent of the existing meteorological department of the French government, viz., the Bureau Central Meteorologique, which is under the Ministry of Public Instruction.

It is noteworthy that France, following the example set a few years ago by Russia, is about to organize a separate and distinct meteorological service for the benefit of agriculture. In the United States, official meteorology is already under the direction of the Agricultural Department, to which the Weather Bureau is attached, and the act of Congress under which this bureau was organized provided that it should be "specially developed and extended in the interests of agriculture"; but in foreign countries an analogous affiliation does not generally exist. Apparently the European meteorological services, which for the most part have but meager funds at their disposal, are not able to be of much direct benefit to the tillers of the soil; and as a distinct group of problems, theoretical and practical, is involved in agricultural meteorology, it has seemed best to organize special services, rather than extend the scope and enlarge the resources of the general services already existing.

This movement found expression at the last meeting of the International Institute of Agriculture, at Rome, when the French delegate, M. Louis Dop, presented an elaborate report on the work in agricultural meteorology now officially carried on in various countries, and offered a resolution, which was adopted, looking to the international organization of such work. This matter will be submitted to the International Meteorological Committee, which, it is expected, will appoint a "commission" on agricultural meteorology, co-ordinate with the commissions that have been appointed from time to time on aerology, atmospheric electricity, solar radiation, etc.

The subject of agricultural meteorology, owing to the fact that it has not heretofore been looked upon as a distinct branch of science, has received far less attention than its immense economic importance entitles it to. The interrelations of weather and climate, on the one hand, and the life and growth of plants on the other—including such matters as the geographical distribution of plants, photochemical climate, phenology, the causes and effects of frost, the meteorology of soils, æolian geology, acclimatization, drought resistance, and such practical problems as frost protection, hail insurance, and weather forecasting for particular crops—should be recognized as a field of research requiring the attention of a numerous corps of workers, trained in both meteorology and biology. At present the workers in this field are very few. Particular problems have been studied from the meteorological or from the biological point of view, but no general survey of the field has yet been taken, and there does not exist, to this day, a textbook of agricultural meteorology worthy of the name. There is no greater desideratum, in the literature of either meteorology or agriculture.

# A New System of Gathering Turpentine

## Conserving the Long-leaf Pine

THE old system of boring long-leaf pine trees for the purpose of collecting turpentine is the most wasteful and destructive method that has ever been used. It is not only the most expensive from the standpoint of labor, but it invariably weakens the trees and always subjects them to destruction from wind and fire. Less wasteful methods have been devised for extracting the resin, yet a good many turpentine men persist in cutting large receptacles or openings on either side of the trees near their bases in which the resin collects. (See Fig. 1.) These holes or boxes, as they are commonly called, are from 8 to 14 inches wide, running up 7 to 8 inches along the length of the tree, and from 4 to 6 inches deep. The trunks are repeatedly hacked immediately above these boxes, thus exposing new scarified surfaces from which the resin oozes and collects in the boxes below. This process of hacking is continued upward on the trunks as high as the men can conveniently reach, and is repeated for five to seven years until the trees are considered fully worked.

With this method there is an enormous amount of waste. Not only is there a 50 per cent waste through evaporation of the pure turpentine oil, which sells for $4.00 per gallon, but in gathering the crude resin from the boxes large quantities are lost through careless handling. A good deal of foreign material, such as scales of bark, chips and needles of the trees, becomes mixed with the crude resin which is collected from the boxes and scraped off the scarified surfaces.

About ten years ago another method was devised which is known as the cup and gutter system. This system has its advantages over the old one in that it does away with the injurious methods of cutting the boxes into the trees. Only the sap wood of the tree is penetrated by this method, and one cup with two gutters which drain the resin into the cup is attached to the foot of each scarified surface. (See Fig. 2.) These cups have a disadvantage in so far that hogs and other animals which feed in the pine forests frequently throw them off the hooks which hold them in place. Evaporation is not wholly eliminated by the use of this method. The earthenware cups also have another disadvantage, since a good many are constantly broken even under reasonably careful handling and must be replaced at a considerable expense. Nor does the use of this system greatly lessen the fire danger, for the resinous substance on the scarified surfaces often catches fire when the woods are burned over, which is done regularly every year in the southern pineries. These periodic conflagrations which consume annually not only millions of acres of young growth but also many millions of feet of merchantable timber, can thus be directly or indirectly attributed to the cause of improper methods of turpentining. The present rate of this destruction is so great that within the next fifteen or twenty years the resin yielding pine forests of the South will be wholly depleted.

It is very important, therefore, that a less destructive method of turpentining should be used. A new system of collecting turpentine in air tight jars which was put into practice a little less than a year ago, promises to be the most economical method ever devised, and it is this system which may possibly revolutionize the turpentine industry in this country. To cut the timber without having it turpentined is equivalent to throwing away the whole of the profits that could be derived therefrom. But the turpentining should be done only provided the oil can be extracted, with absolutely no damage to the timber or to the lumber product. Frequently turpentine men lease their long-leaf timber for $2.50 per acre for the privilege of working it for the turpentine, though the timber on it may be worth $4.00 per acre to the sawmill men. After the turpentine operator is through with the job fully one-half of the trees are invariably dead, all are fire scarred, and those which remain after nine years (the usual length of a lease) are worth to the millmen only about $2.00 per acre.

The new turpentine cup system consists of an air-tight glass jar of about one pint capacity which screws into a metallic cover similar to a tin can top. (See Fig. 3.) To this is attached a somewhat similar cap at right angles which is placed into a shallow 2⅝-inch hole bored into the sapwood of the treee. A metal brace of the same material as the cover serves to hold the caps at right angles to each other. The brace is hollow and provides a passage for the resin from the tree into the glass jar which is attached to the horizontal cap. The cup is firmly attached to the tree by first smoothing off the rough outer bark over a few square inches and then placing an ordinary extension bit of the vertical cap into the hole to a depth of about one-fourth inch. Before forcing the vertical cap into the hole two three-quarter inch diverging holes several inches deep with a slightly upward inclination are bored from the center of the larger hole. The vertical cap is then forced into the large hole and a glass jar screwed into the horizontal cap. The gum flows from the three-quarter inch holes into the vertical cap and from there through the hollow brace into the glass jar. When the jars become full they can be unscrewed, emptied and replaced.

This method has proved very successful, and it will not only be a great thing for the turpentine industry, but it will be a great step in advance toward conserving the long-leaf pine which is being rapidly depleted through improper systems of extracting the turpentine. The system has the advantage that it can be continued for an indefinite period without damage to the tree. It is the only method that protects the trees and saves all waste. The pines thus tapped will last for a number of years. The system not only does away with the old chopping or hacking method, which is a very expensive and destructive operation, but it protects the tree from fire, which is almost inevitable when dry scarified surfaces are exposed; and moreover the trees are not retarded in their growth.

Fig. 1.—The old "box" system.

Fig. 2.—Cup and gutter method.

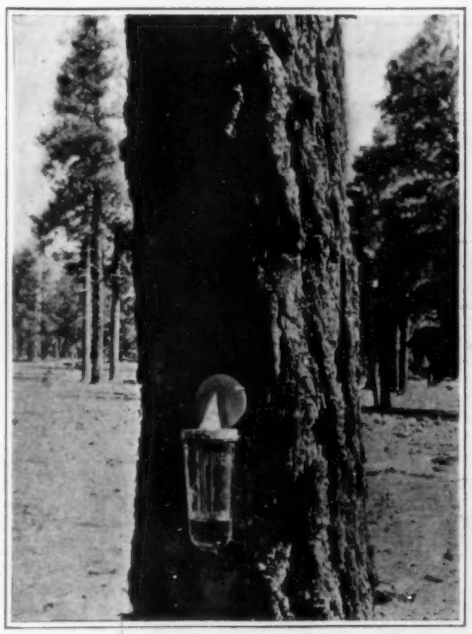


Fig. 3.—System of turpentining with an air-tight cup attachment.

Fig. 4.—Long-leaf pine trees, showing the scarified surfaces.

A NEW SYSTEM OF GATHERING TURPENTINE

### Wooden Shoes

ACCORDING to a report from Vice-Consul D. P. De Young at Amsterdam, Holland exports more wooden shoes to the United States than to any other country. Many hundred pairs are now worn in Michigan, Iowa, Missouri, New Jersey, and other States. The remarkable statement is made that there is more wooden footgear worn in Chicago, Grand Rapids, or Holland, Mich., than in the city of Amsterdam. Other sections importing this practical article of dress extensively are Paterson, N. J., St. Louis, Mo., Lancaster County, Neb., and Marion County, Iowa.

The shoes exported from the Netherlands are mostly made in large factories by modern machinery. On the contrary, the wooden shoes worn in that country are generally hewn to the measure of the customers' feet in the village shoe shops, and the local price varies according to the amount of lumber used and the market price of the raw material.

# Two New Blériot Monoplanes

## Descriptions of the Latest Aeroplanes of the Celebrated French Pioneer

NOT content with having won practically all the great European circuit aeroplane races during the past summer, M. Blériot has been hard at work of late evolving new designs. His two latest monoplanes, one a racer and the other an experimental "Canard" or "Duck," are illustrated herewith.

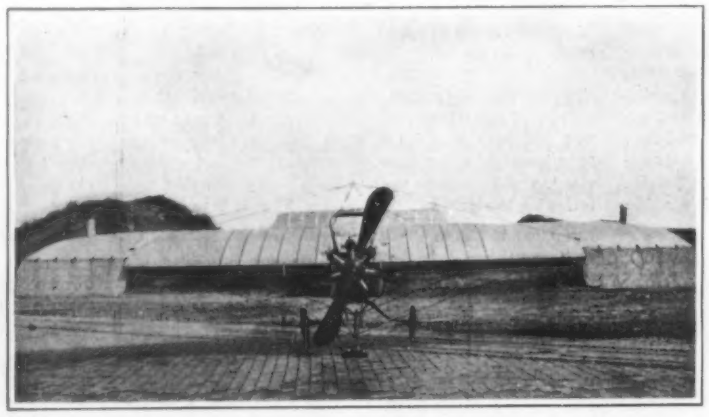
The new racer displays a general refinement of lines and an effort to reduce head resistance. To effect the latter, the upper flat cross member of the chassis has been lowered and placed under, instead of on top of the body. The resulting shortening of the steel-tube uprights of the chassis serves to reduce head resistance. But in addition to this the body has been made extremely narrow in front, while at the rear it flattens completely and terminates with an absolutely flat horizontal rudder. The extreme front end narrows down to not much over a foot in width but where the aviator sits it is of comfortable space. The motor and tanks are well covered with a long aluminium hood so that there is little chance for the aviator to get oil in his face from the exhaust of the motor or from leaking tanks. The usual running gear and shock absorbers are used in front while the bamboo skid is now placed at the extreme rear end of the body or fuselage. Besides a simple V-shaped support for the guys above the wings, this new racer has the same arrangement below, but the tubes which form the lower support are considerably longer than heretofore, and they are well guyed to the body. They carry at their lower ends the warping mechanism, which seems to be somewhat different from that used heretofore. The vertical rudder is of peculiar shape, its location on top of the body being similar to that of the rudder on the No. XII.

This new model, No. 27, has a length of 7 meters (23 feet), a spread of 8.9 meters (29 feet), and a supporting surface of but 12 square meters (129 square feet). The weight complete is 430 kilograms (948 pounds), so that the weight lifted per square foot amounts to some seven pounds. With a 50-horse-power Gnome motor, this model Blériot has developed a speed of 130 kilometers (81 miles) an hour.

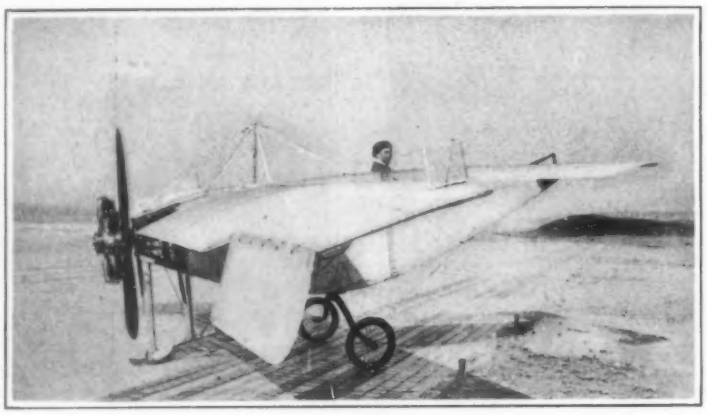
One of M. Blériot's early monoplanes was constructed upon the same lines as his latest "Canard," as this type of aeroplane, with pilot in front in a covered body and motor behind, has come to be called. The Voisin brothers were the first to bring out a biplane of this type some months ago, although Santos-Dumont was the inventor of it and the first aviator in Europe, which he became with this type of machine. The Voisin "Canard" has a much longer body. It has been fitted with hydroplane floats and has made many excellent flights from the water. It is seen skimming the surface in one of our illustrations.

The new Blériot "Canard" is much shorter than the Voisin. It is a monoplane with a thick, short body projecting out in front, the horizontal rudder being at the bow. Two tiny vertical rudders on top of the main plane at each end serve to steer. The wings are guyed to an inclined rod underneath, which extends forward from a shoe on the bottom of a vertical post. There is no warping, generous ailerons being used instead. The leaf spring, axle and the strut to which the wings are guyed, recall the Nieuport monoplane. They are quite similar.

The total over-all length of this new monoplane is but 5.5 meters (18 feet). The spread and surface are the same as with the racer, while the weight with a 50-horse-power Gnome motor is 400 kilograms (882 pounds). The aviator's seat is so far forward that it would seem as though he ran very little chance of being injured by the motor in case of a smash, since there are five or six feet of stout fuselage between the engine and the pilot. No flights of any moment have been made so far as we know by this new machine as yet. There is no doubt that it will fly, however, nor that a machine of this type offers several advantages, such as have already been mentioned by Voisin in the description of his "Canard" in the SCIENTIFIC AMERICAN of recent date.



Rear view of the Blériot Canard.



The Blériot Canard, with motor and propeller at the back of the aviator.

The new Blériot No. 27 as seen from the rear.

Front view showing details of Bleriot monoplane.

TWO NEW BLÉRIOT MONOPLANES

### The Aeroplane in Naval Service

**By André Beaumont**

*IN a recent issue of the Paris "Le Temps," the young French naval officer who has made such a brilliant record as an aviator under the pseudonym of André Beaumont, discusses the present status and future possibilities of the aeroplane as a factor in naval maneuvers. We take pleasure in reproducing here the greater part of this interesting exposition, omitting some introductory remarks of a biographical character, and taking up the author's words at the point where he enters upon his main theme.*—ED.

Must we seek for marine service the ideal machine which takes flight from the earth, poises itself upon a troubled sea, renews its flight unharmed, executes maneuvers about the fleet, and then at will returns to land or casts anchor in port?.

Unfortunately such a machine does not exist to-day, and I am afraid it will not be produced for a year or two, despite the laudable efforts of our constructors, and meanwhile must we be deprived of the aid of aviation in the marine?

To my mind that would be a mistake, and we should be depriving ourselves of an auxiliary already powerful and capable of becoming redoubtable if handled with the skill and daring which have always been among the professional qualities of sailors.

Why wait for future progress when the actual state of affairs is so satisfactory?

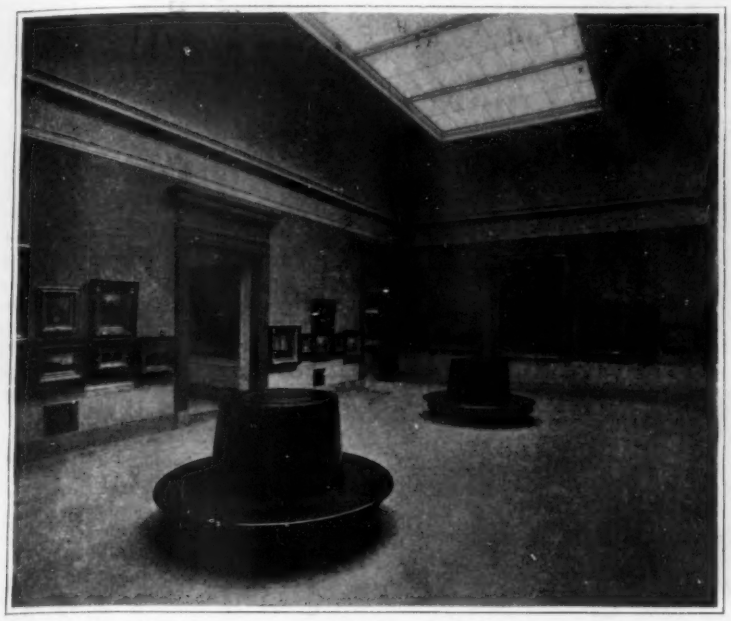
Let the constructors continue their researches; let us help and encourage them, and, if necessary, undertake parallel studies in the navy. Let us urge experimental trials, but let us begin by adopting the actual machine that we may profit immediately by the progress attained.

Let us consider how the machine of to-day can be of service: We can have in the first place the "coast aeroplane," which, rising from a point of departure in proximity to a port of war, could fly out to a great distance over the water (30 miles, for instance), and, mounting to a great height, from 1,500 to 4,500 feet, according to the clearness of the atmosphere, descry upon the distant horizon the presence of a hostile squadron or a fleet of torpedo boats. It could observe the number, strength, formation, and direction of the enemy, and in less than an hour and a half return with a report which would at present require the employment of two or three cruisers, or ten torpedo-boat destroyers, and two or three times as great a lapse of time.

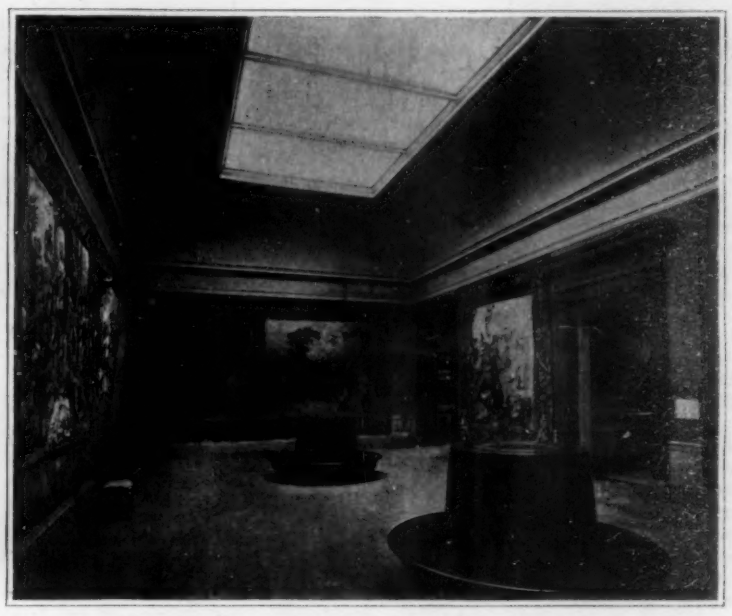
Then there is the search for submarines or mines placed by the enemy in the channels of safe exit from ports. The recent experiments of the aviator Aubrun at Cherbourg have shown that from a height it is possible to see a considerable depth down into the water.

The "aeroplane of the high seas" would be capable of a mission of larger extent and greater radius than the coast aeroplane. This is the machine belonging to a specially equipped convoy boat (*not* a man-of-war). The aeroplane rises from

(Continued on page 397.)



Ideal artificial lighting for a gallery, intensity of illumination practically uniform, light is directed to the walls, not the floor.



Excellent natural lighting obtained by the use of a prism-shaped monitor skylight with opaque top and diffusing glass sides.

# Indoor Lighting, Natural and Artificial

## Directed-indirect Illumination for Art Galleries

By Putnam A. Bates

EXTERIOR lighting involves problems of a quantitative character, whereas interior illumination is more qualitative, and while both are important, the successful solution of the interior problems has perhaps the greater practical value; for it is obvious that while indoors our eyes are subjected to greater stress.

Apparently there is no reliable and clearly defined record which will guide us in providing both natural and artificial conditions of illumination closely corresponding to those under which the eye is most capable of rendering its best service. At least an exhaustive search, in connection with which the writer has assisted, failed to produce any real data or indication of previous thorough and logical analysis, and consequently, in undertaking the illumination problem of an important exhibition picture gallery recently erected, it became necessary to inspect many of the existing buildings of similar nature, after which it was deemed advisable to approach the problem on entirely new lines.

While this article, therefore, will be confined largely to a description of the solution of the particular problem undertaken, there is much information brought out in the analysis that applies directly to the illumination of almost any kind of an interior, the principles, of course, being observed, rather than the exact arrangement or construction.

Quite to the writer's astonishment, no one seemed to possess the key to the whole situation, although many persons who were interviewed seemed to appreciate, in a rough way, the defects noted in the existing buildings. Daylight illumination has received a good deal of study in reference to special interior problems, but the records do not show that these investigations have been carried sufficiently far for us to learn from them the intensity of illumination that pictures, for example, should receive, or the best relative intensities for the various fixed surfaces, ceiling, walls and floor, of a given room. Incomplete as were the daylight experiment data, the results from previous attempts to provide scientifically correct artificial lighting proved to be even more unsatisfactory. Before enumerating several of the violations most frequently committed, I will mention briefly a few of the principles governing the subject of light and its effect upon the human eye.

Through many ages, the human eye has accumulated the characters wrought upon it by evolution and the limitations of its environment. It works best over a rather limited retinal area and through a range in intensity of light which, although great, is yet much smaller than, for example, the extreme variations in brilliancy provided by the sun's rays. Everyone is familiar with the distress caused the eye by sudden alternations of light and darkness, and it seems to be well established that the discomfort caused by the reflected glare from sand, water or snow is due to the inability of the rather transparent lower eyelid to obstruct sufficiently the light that approaches the eye in an upward direction, a condition to which the human eye is not naturally accustomed. All these matters are of importance to consider in connection with interior lighting, and the subject of the following serves as an excellent illustration.

Visitors view pictures to study their relative merits, and are often so absorbed in this, as not to realize, until afterward, under what trying conditions their eyes have been used. The lighting of a picture gallery or exhibition room differs from other interior illuminating problems, but the underlying principles may, nevertheless, be otherwise applied when they are once appreciated. First, the main objective is to provide an illumination which will enable persons to view exhibits with the least possible discomfort or effort to the eye; second, the exhibits will be on the walls and, therefore, the light must be directed there; it, however, must be diffused; third, should the floor be especially bright, or the source of illumination in the field of vision, there is a physiological effect exerted upon the eye which makes the careful viewing of objects not only difficult, but most tiring.

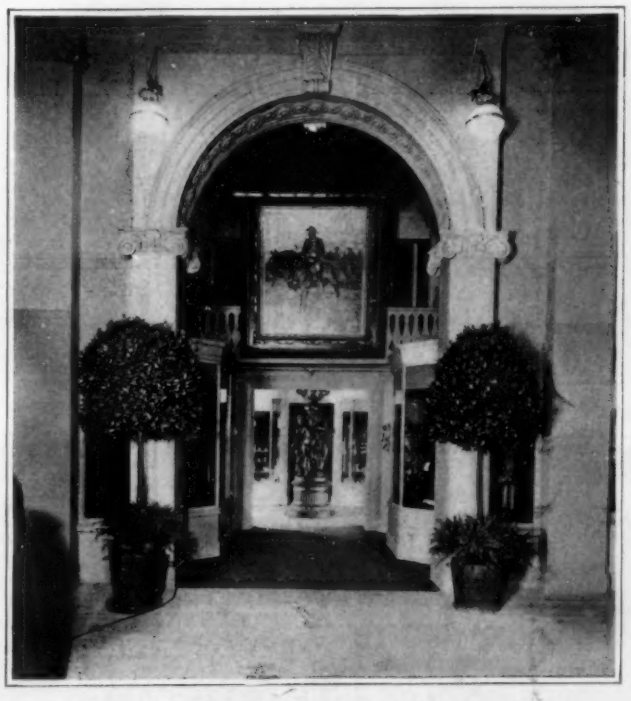


Fig. 3.—Lighting that does more harm than good.

The most suitable intensity of light and the seemingly contradictory requirements that it must be both directed and diffused are difficult conditions to establish, but it is obvious that in every picture gallery or exhibition room the need for solving these essential points has been felt. How frequently do we see the gallery skylight provided with a roller shade or an opaque canopy placed in the center of the room, under which observers may stand to view the pictures without exposure to the direct effects of the entering light. These are but makeshift methods of regulating the intensity, and by negative means, directing the light. Until most recently, however, these devices were regarded as essential features of gallery equipment.

An interesting feature of this situation was, that the results desired, as indicated by these makeshifts, were quite correct, for as one eminent critic described the situation, "the best results would be obtained if in some way the direct rays of the sun's light could be shut out, but the remainder of the daylight be admitted through an overhead skylight, and each visitor be provided with an open umbrella to hold over his head while viewing the pictures." This was the remark of an artist whose knowledge of science and physics was limited to his original observations, but his expressed idea conveyed to the writer that the full range of the sun's brilliancy was vastly too great, and its effect should be modified to correspond more nearly with the limitations of the human eye, and the largest portion of the entering light should be directed toward the walls and not allowed to fall directly on the floor, as is generally the case, where the hung canopy is not used. The canopy, however, is not a desirable intrusion at best, but it is often used to obstruct the downward flood of light, which is sure to enter when the sun is high and the surface of the glass area is entirely skyward, a mistake in roof design heretofore almost universally made. It is, nevertheless, a fact that in spite of its unsanitary objections and unsightly appearance, from a lighting standpoint, the presence of the hung canopy is to be preferred in galleries or exhibition halls where the skylight is so constructed. Hence, the manner in which the light is admitted is all important.

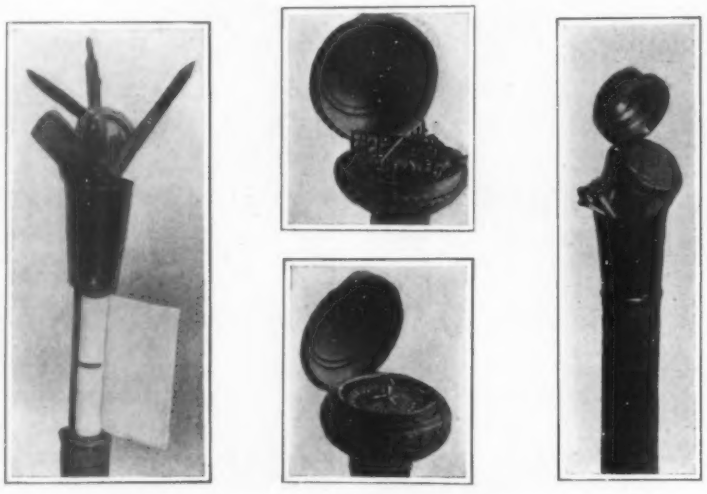
The area of the glass opening in the gallery ceiling governs the amount of light that can be admitted, but the shape of the superstructure or upper skylight practically determines the manner in which the light shall enter. Although well above the room in which the exhibits shall be, this "superstructure" should be most carefully designed. Its top must be opaque so

(Continued on page 397.)

# Curiosities of Science and Invention

## What French Walking-sticks Contain

SOME time ago we illustrated a number of French walking-sticks which were fitted with weapons of various kinds ranging from daggers to rifles. The ingenuity of the Frenchman has not been confined to the making of weapons out of apparently harmless canes. In fact there is quite a variety of uses which the cane is made to serve. In the accompanying series of photographs, some of these are shown. In the figure to the right is a cane fitted with a coin box and a match box, these being contained in the head, which is provided with a carefully concealed lid. The coin box is arranged to permit of depositing and easily removing the coin by a slight pressure of the thumb, thus obviating the necessity of fishing for coins in the pocket. The upper one of the two central figures shows a cane handle containing a complete outfit of the game known as "Petits Chevaux." When the lid is open, betting can begin, and the horse crossing the wire first wins the stakes. One of the latest Parisian novelties consists in a ladies' parasol handle containing a roulette wheel which can be used for gambling at any place or moment. These handles have become very popular. They are of fine workmanship and generally of gold or silver. The last of the series shows a handle containing almost everything that one would be likely to need. A long sheet of paper is wound around the rod from which pieces may be torn off for taking notes. When the lid is opened penknife, pencil, nail file, combs and looking glass are disclosed. These objects are small, but large enough for practical use.



French walking-sticks and parasols serve many uses.

## Edible Birds' Nests

THE uninitiated are apt to think of birds' nest soup as a most disgusting stew of twigs, feathers and what not. As a matter of fact, the nest used by the Chinese is a very delicate, semi-transparent, gelatinous substance, built by the swallow-like birds known as the Salangane. The nests are found in the islands about Siam and the Malay Archipelago, and the harvest in the year 1909 was 18,000 pounds, valued at over $100,000. It used to be thought that the nest was formed of inspissated saliva secreted by the highly developed glands of the bird. Now it is known that the nest is made of a species of alga, gathered by the bird. The season for harvesting the nests lasts from April until September. It takes three months to build the first nest, and just before the eggs are laid the nest is stolen by the collector. The bird immediately sets about the building of a second nest, taking thirty days for the work. This is also stolen before the eggs are laid. The third nest, however, is unmolested and the birds are permitted to raise their young, after which the nest is taken and sold. The nests are built in most inaccessible spots, among the cliffs along the coast, and the natives must risk their lives to reach them. In preparing birds' nest soup the nest is washed in cold water and then cooked for eight hours in a closed vessel, after which it is mixed with chicken broth, seasoned and boiled for a quarter of an hour. This dish is considered a great delicacy among the Chinese, and Occidentals who have tried the soup find it very palatable and much resembling chicken soup.

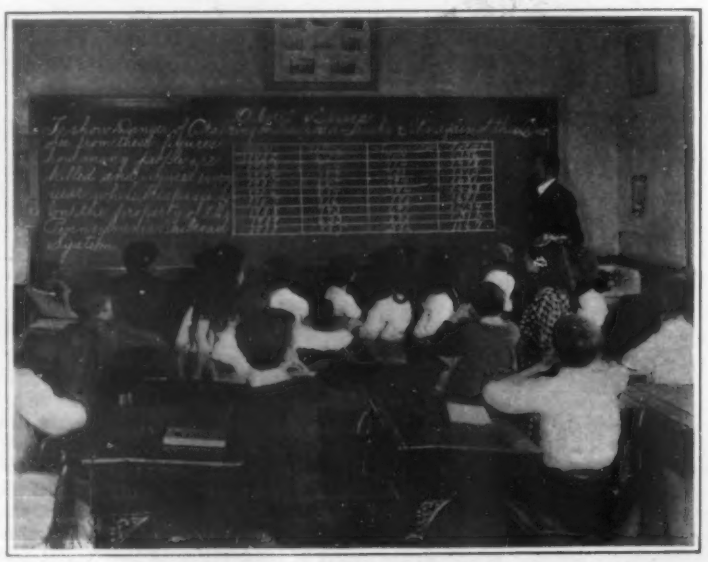
Edible birds' nests of the Salangane.

## The Old Man of the Sea

PROBABLY one of the most curious of all the marine creatures that have been brought to light in recent times is the fish head here shown possessing a startlingly human-like appearance. "The old man of the sea," as the fish has been dubbed, was picked up in the waters around Cape Town, Africa. The realistic photographs shown were made at the New York Aquarium. The head was not manipulated in any way. The ragged outline at the back of the head shows where it was severed from the body. The lines on the lower part of the face are natural and are the outlines of the maxillary and other bones of the jaws. The nose has shrunk somewhat in drying. In life the resemblance to the human face was even more striking. The conical front teeth are shown in the photograph. The lateral teeth are very strong and molar-like, evidently for the purpose of crushing shells and, like the famous king of the Cannibal Islands, "he has two rows in his lower jaw." Photographs of the head have been sent to a number of well known authorities on Ichthyology in America Europe, and Africa for the identification of the species.

Human-like fish head.

"The old man of the sea."



School children receiving an object lesson on the danger of walking on railroad tracks.

## Fatalities to Trespassers on American Railroads

THE number of lives lost in wars today, with fighting continually going on in some corner of the world, is nothing as compared with the annual record of fatalities due to trespassing on American railroads. Ignorance or carelessness on the part of the trespasser is responsible for most of this. The railroads are bending every effort to cut down the awful toll of death by posting signs and maintaining police patrol, but they will never be completely successful without the cooperation of the general public.

Every densely populated industrial center near a railroad is a death center. The working classes in crowded districts, and tramps, furnish the majority of victims. Railroads say people must be taught to have more respect for their lives and safety.

With education of this kind in view, the Pennsylvania Railroad is preparing pamphlets in eight or nine languages. These will be distributed in schools with instructions to the pupils to take them into their homes. The Board of Education of the State of Pennsylvania has promised its aid. The assistance of clergymen has been solicited, and from hundreds of pulpits the danger of trespassing has been preached. From the good roads trains run through rural districts, and in the farmers' granges the warning has been sounded.

As a result of the education movement and a vigorous campaign against tramps, the number of persons killed while trespassing on the Pennsylvania Railroad's property in violation of the law, has been gradually reduced from 887 in 1905 to 585 in 1910, and the number of injured has fallen from 794 to 582 in the same time. To put these figures in another way; in 1905 the railroad was killing trespassers at the rate of three a day for five months of the year, and two a day for the remaining seven months, while in 1910 the number sacrificed had decreased to two a day for seven months, and one a day for the other five. Railroads are perhaps the greatest sufferers from the tramp evil, and they are willing to do all in their power to stamp it out, but this cannot be accomplished until the citizen realizes the seriousness of the matter and takes his part in the campaign.

Until this country follows the lead of Europe in the matter of legislation to check vagrancy there can be no satisfactory cure for the evil, but if the small communities will punish offenders, instead of passing them along, it will be greatly ameliorated. By doing this, and by aiding the railroads in their campaign to educate the public against trespassing, more loss of life will be averted than by establishing world peace.

## Engineering

**A Record Cargo on the Pacific.**—The carrying power of the large freight steamer is well illustrated in the case of the steamship "Minnesota," which will sail from Seattle next December with a cargo which establishes a record in the Pacific trade. She will carry 14,000 tons of flour and 2,000 tons of general merchandise, every cubic foot of her tonnage space being appropriated.

**Towing Locomotives for the Panama Canal.**—The Isthmian Canal Commission will shortly advertise for bids for an experimental towing locomotive for towing steamers through the locks of the Panama Canal. Should this machine be successful, bids will be asked for thirty-nine more. Four locomotives will be used for each vessel, one on each bow and one on each quarter. The locomotives will run on rack railways, and they will be sufficiently powerful to hold the largest vessel in absolute control.

**The Ram a Terribly Destructive Weapon.**—Although it is considered that the ram will rarely be used as a weapon of attack in future naval conflicts, there can be no denying its destructive power. A recent survey of the "Olympic" in the dry dock of Harland & Wolf shows that there is a triangular hole in the ship's side reaching from a point 14 feet above to 30 feet below the water line, which will take from six weeks to two months to repair, and will cost about half a million dollars.

**Slides at Gatun Locks.**—The excavations for the Gatun Locks have caused slides of some magnitude to occur, and the removal of the material will cause a delay of some four months' time. As usual, the occurrence of a slide has provoked alarming rumors, and, as usual, the trouble has been greatly exaggerated. As in the Culebra Cut, so here, the material is of an unstable nature; but when the difficulty has been met, as it will be, the construction of the locks will proceed, and once the concrete work is in, all trouble from earth movements will have ceased.

**The Reconstructed Battleship "Oregon."**—None of the older battleships of our navy is better known or has a more sentimental interest for the American people than the battleship "Oregon," whose voyage around the world, terminating in her active participation in the battle of Santiago, will long be remembered. This ship has been undergoing a thorough reconstruction, and she is now being given exhaustive tests to ascertain her effectiveness for modern war duty. Particular attention will be given to her new fire control system, to the wireless apparatus, and to other modern equipment.

**Navy Yard Reforms.**—As the result of Secretary Meyer's recent visit of inspection among the European navy yards, he has decided to make a tentative adoption at the Norfolk yard of the system of yard management which is in force at the yards of Vickers, Ltd., Barrow-in-Furness, England. This system has been worked out by the Vickers firm along the general lines of scientific management of which we have heard so much lately in this country. In the opinion of the Secretary, it is better adapted to conditions in our yards than the admirable but elaborate method known as the Taylor system, which has tended to provoke rather serious opposition on the part of the labor unions.

**Russian Naval Activity.**—The dreadnought "Gangut," the fourth of the powerful dreadnoughts which Russia is building in the Baltic, was recently launched. This vessel is one of a class of four ships, including the "Gangut," the "Petropavlovsk," the "Sevastopol," and the "Poltava." These vessels are of 22,300 tons displacement, and their distinctive feature is the method of carrying the main battery of twelve 50-caliber, 12-inch rifles. These will be mounted in four three-gun turrets, one forward and one aft on the center line, and one on each beam, the two beam turrets being placed diagonally. This will give a theoretical concentration of fire greater than that of any other ship, namely, nine 12-inch ahead, nine astern, and twelve on each broadside.

**Fender Chains at the Gatun Locks.**—The character of the bids which are being asked for work on the Panama Canal indicates how nearly this great work is approaching its final stage. Proposals have been asked for materials for the heavy chain fenders for preventing ships from running into the lock gates with which all the locks will be provided. Ships will not be allowed to navigate the locks under their own steam; but should they escape from the control of the towing locomotives, they will be prevented from running into the gates by massive chains stretched across the lock, and controlled by powerful hydraulic cylinders, which will exert a resistance represented by 750 pounds to the square inch on the pistons. A 10,000-ton ship running at four knots an hour, striking the fender chain, would be stopped in a distance of 72 feet 6 inches.

## Science

**Lamps for Lighthouses.**—The use of electric lamps for lighthouses presents certain disadvantages. It is therefore with some interest that we follow the course of some experiments in France on the use of a new kind of incandescent light for lighthouse purposes. The lamp in question has a number of filaments mounted somewhat after the fashion of the fibers of an incandescent gas mantle. In this way a very strong light is secured, which, moreover, has the desirable property of being very uniform in all parts of the circumference. According to recent trials the new type of lamp gave twenty times as much light as a Welsbach burner and required very little attention. The lamp is particularly adapted for shore lighthouses which are easily placed in communication with electric light mains.

**Improvement in Incandescent Gas Lighting.**—Experiments are at present in progress in Paris as the result of which it is hoped to secure an increased light efficiency from incandescent gas burners. Under present conditions, the gas pressure in the mains is sufficient to draw a certain amount of air into the burner, where it becomes mixed with the gas, causing the characteristic blue flame. But the amount of air thus drawn into the flame is only about three times that of the gas, whereas, for the best effect, the ratio should be five to one. It has been found that by compressing the gas in the mains the desirable ratio of air can be caused to enter the flame. One of the boulevards in Paris has lamps working on this system, and the results are exceedingly satisfactory.

**Electric Light for Sterilizing Milk.**—We read in a Daily Consular Report a note from Consul Mahin, of Amsterdam, according to which a local periodical refers to the effect of ultra-violet beams on bacteria and to the fact that such beams are abundantly developed by mercury incandescent lamps, and relates that through this medium milk may now be sterilized in a few minutes. An apparatus has been constructed, it is explained, whereby the milk flows in a thin stream along an electric light. Demonstrations were first made with water infected with different kinds of bacteria, and it is said that the water was purified in a few minutes, without appreciably increasing its temperature. The result is attributed to the ozone formed under the influence of the light, but the demonstrations must be conducted where there is sufficient room for the light to burn freely. This method of sterilization, without heating or adding preservatives, is believed to have great hygienic value in respect to nursing children.

**The Influence of Dust on Mortality.**—Out of every thousand of those whose occupation calls for constant work in dusty quarters, five die of consumption, according to German official figures; whereas among those who are not exposed to the action of dust, only two out of a thousand die of the disease named. As regards the comparative danger of the different sorts of dust, the following figures will prove instructive:

| KIND OF DUST. | |
|---|---|
| *Metallic.* | |
| Iron | 6 |
| Lead | 8 |
| *Mineral.* | |
| Stone | 35 |
| Porcelain | 14 |
| *Organic.* | |
| Leather, fur and feathers | 5 |
| Wool and cotton | 5 |
| Wool and paper | 6 |
| Tobacco | 7 |
| Total | 86 |

**Influence of Room, Light and Fresh Air on the Growth of Children.**—To show the influence of room, light and fresh air on health and growth, the following figures are given, concerning the height and weight of boys in Bourne Village, England, as compared with those in Birmingham slums. Bourne Village has 840 houses, distributed at the rate of only nine to the acre; at the time of making up this table, the population was 4,000.

*Weight of Boys (pounds).*

| Age, years | 6 | 8 | 10 | 12 |
|---|---|---|---|---|
| Bourne Village | 45 | 52.9 | 61.6 | 71.8 |
| Birmingham slums | 39 | 47.8 | 56.1 | 63.2 |

*Height of Boys (inches).*

| Age, years | 6 | 8 | 10 | 12 |
|---|---|---|---|---|
| Bourne Village | 44.1 | 48.3 | 51.9 | 54.8 |
| Birmingham slums | 41.9 | 46.2 | 49.6 | 52.3 |

The death rate (average of five years) is for Bourne Village 5.5 and for England and Wales 14.9, per 1,000. The infant mortality (average of five years) is for Bourne Village 68 and for England and Wales 121.8, per 1,000 live-born children.

## Electricity

**Royal Experiments in Wireless Telegraphy.**—King Albert of Belgium is keenly interested in wireless telegraphy. He has a complete radio-telegraph equipment in his palace at Laeken where he is fond of conducting experiments.

**Hydro-electric Power for Constantinople.**—Constantinople is soon to be supplied with electricity from a hydraulic power station on the Sakania River, 80 miles away. Here two turbine stations will be built, one of 15,000 horse-power, using a 180-foot head of water, and the other of 8,000 horse-power, employing a head of 120 feet.

**Electric Railroads in the Pyrenees.**—About 300 miles of railroads are being built in the Pyrenees. These railroads are to be operated by electricity which will be furnished from water power stations in the mountains. Power will be supplied at a voltage of 55,000 volts, which will be stepped down to 12,000 volts for the trolley wires. The locomotives will be provided with transformers for further reduction to 285 volts.

**Novel German Transmission Poles.**—A novel type of reinforced concrete pole is now being used in Germany for transmission lines. The pole is perforated from the top to a point near the base. The perforations are large enough to permit of inserting the foot, so that the lineman does not require climbers to reach the wire brackets at the top. The poles are thus virtually given the form of narrow ladders.

**Wireless-Controlled Submarine.**—According to a recent press report, some interesting experiments have been conducted by the British navy in the control of submarine boats from cruisers. These experiments have been kept very secret, but it is known that a submarine boat in the waters off Selsey was controlled by wireless telegraph apparatus aboard the cruiser "Furious." Experiments were also conducted with torpedoes, controlled by Hertzian waves.

**Electric Power from Water Supply.**—The Wachusett reservoir, which supplies Boston with water, has a capacity of 68,000,000 gallons. The reservoir is located 395 feet above the level of Boston, and as a 300-foot head is considered ample for the city, the balance is to be used for the generation of power. A hydro-electric plant comprising four turbines of 1,000 kilowatt capacity, has been installed. The plant has cost $125,000, but the current it will supply should bring in a revenue of $25,000 per annum.

**Overhead Alternating Current on Swiss Railways.**—After seven years of study, a commission appointed by the Swiss Republic to investigate various methods of electrification has decided to recommend the overhead rather than the third rail system for the Swiss National Railways. There will be 1,830 miles of railroad in the Swiss system, and it recommends that a single-phase alternating current be used at a pressure of 15,000 volts. The cost of the entire system will be about thirteen million dollars.

**Electric Trucking.**—In his presidential address before the Electrical Vehicle Association of America, Mr. W. H. Blood, Jr., referred to the fact that the average amount of freight handled on the streets of Boston per day amounts to 25,000 tons and that the total freight carried by wagons in the United States is more than ten times as much as that carried by railroads. He pointed to these facts as indicating a large field for motor trucks in this country and stated that were this freight handled by electric power, it would require three million power wagons.

**Battery Truck Crane.**—There has been a demand at great railway and marine terminals and in manufacturing plants for a device for handling freight and materials over moderate distances. To meet this demand an electric motor truck, fitted with a swinging crane, has been designed by the General Electric Company. The crane's hook is raised and lowered by a one-ton hoist, driven by a motor, which, together with the motor that operates the vehicle, is supplied with current from a battery. The motor truck crane is mounted on traction wheels, and has a short wheel base so that it may make sharp turns about shop aisles and among piles of material in congested piers and storage yards.

**Storage and Primary Batteries.**—According to a preliminary report issued by the Census Bureau, the value of the storage and primary batteries manufactured increased from $3,679,000 in 1899 to $4,244,000 in 1904 and $10,612,000 in 1909, or 188 per cent during the decade. Both storage and primary batteries consist of various elements which are not always combined and sold together as a unit by the same manufacturers, and yet it is not until these are brought together that a complete cell is constituted. Many of the parts and supplies used are manufactured outside of the electrical field, and therefore the statistics shown in this report do not convey a correct idea of the importance of this branch of the industry.

# Dropping Bombs from Flying Machines

## The Aeroplane as an Offensive Weapon of Warfare

By Riley E. Scott, formerly Lieutenant U. S. Army

IN this age of scientific armament, every new invention that bears at all upon the art of warfare is carefully weighed in the balance of military usefulness. The balloon, telegraph, telephone, automobile, motorcycle and, more recently, wireless telegraphy, have all demonstrated their ability to further the dread game of war and have, consequently, been added to the standard equipment of armies. While enthusiasts are heralding the advent of universal peace, the silent, non-sentimental sentinels of warfare are eagerly acquiring every device and invention that may give them an advantage in the next clash of arms—perhaps the world's greatest war!

To the military man, warfare is a science; no sentimental theories or fancies enter into his cold calculations; no "dream of the ages" appeals to him unless it can add to the efficiency and destructiveness of his engines of war. Consequently, when word went round the world that man had flown, that a heavier-than-air machine had actually risen from the ground, military authorities did not let enthusiasm run away with judgment; they placed a "watch" on this new invention and the more progressive nations took steps to test it carefully with a view to its use in warfare. Within less than three years, its usefulness, even necessity, for scouting and reconnaissance work has been proven beyond a doubt, and, in consequence, the aviator has taken his place in the military establishment and aviation corps have become a part of the organization of armies. From developments in recent maneuvers, it is safe to predict that, in the next great war, the initial battle-clash will be between squadrons of scouting aeroplanes and that many a deed of devotion and daring will inspire the pen of the future historian.

Much has been said and written lately about the use of the flying machine as a destructive weapon. "Bomb" dropping has been a popular feature of recent aviation meets and enthusiastic reporters have given their imaginations full rein, with the result that cities have been destroyed, forts demolished and battleships sunk. It must be observed, however, that all such tests have been made from heights of three hundred feet or less, at which range an aeroplane would not have a ghost of a show against machine guns, shrapnel, rapid-fire guns or even rifle fire. When we consider aeroplanes flying at reasonably safe heights, say between one and two miles, the problem of accurately dropping projectiles becomes a difficult one and scientific calculation must take the place of guess-work.

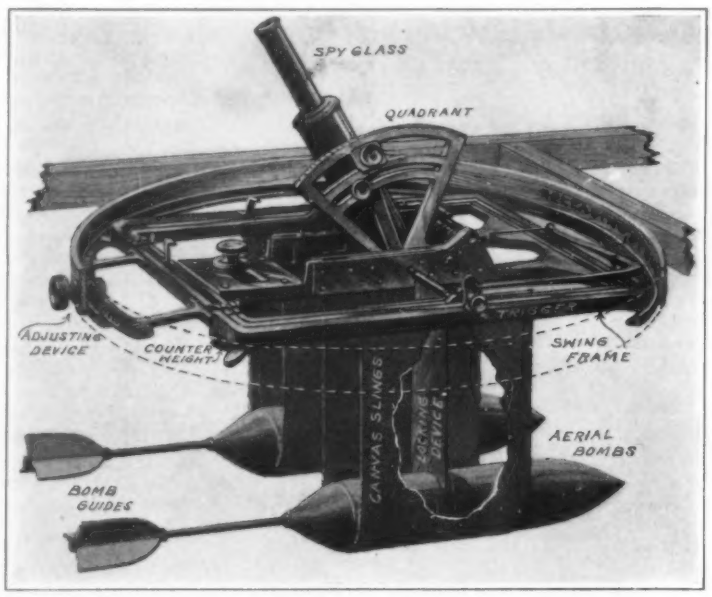
Granting that a reasonably accurate method has been or will be developed for dropping projectiles, let us inquire what damage can be done.

1st, Against Armies.—At the beginning of a battle, usually about one-third of the troops are on the firing line in extended order, while the remaining two-thirds are massed in supports and reserves in the rear of the firing line in positions offering the best protection from the enemy's fire. These supports and reserves are massed in close order, they cannot be greatly extended, for the commanding general must have them under his thumb in order to quickly reinforce weak or threatened parts of his firing line at any time. Still farther to the rear are the wagon trains, artillery parks, lines of communication, supply depots, etc. An aeroplane operating against armies in the field would, therefore, probably use *shrapnel*, an explosive shell filled with hundreds of bullets and equipped with a time-fuse in such manner that it can be exploded above bodies of troops on the march, supports, reserves, wagon trains, camps, etc. Shrapnel is considered one of the most effective projectiles used in modern warfare, and it does not require a military expert to imagine the havoc it would work on a body of troops *en masse*. Moreover, the moral effect of such a weapon would be tremendous.

2nd, Against Cities.—In operations against cities, aeroplanes would use incendiary bombs, small bombs filled with some material which would set fire to combustibles on contact. Dozens of such bombs could be carried and a few aeroplanes could soon start a general conflagration. Any activity on the part of the fire department could be quickly dampened with a few shrapnel.

3rd, Against Fortifications.—Any one familiar with sea coast fortifications knows that the accuracy of the big guns mounted there depends altogether upon the range-finding system. These systems are of two kinds, horizontal and vertical. Both systems depend upon more or less delicately mounted instruments, mounted in buildings screened and protected from the harbor but not from the *sky*. In fact, they must be above the parapet so as to get an unobstructed view toward the harbor. Consequently, it would not be necessary to pick out the separate emplacements and guns for destruction, it would only be necessary to drop a steel projectile filled with high explosive, lyddite, for instance, on or near the range-finding bases. These being out of commission, the costly guns become as useless as so much junk. Magazines, barracks and store-houses could also be destroyed.

4th, Against Battleships.—The most difficult target for an aeroplane would probably be a battleship, on account of its relatively small size and its rapid movement. Night attacks and attacks while at anchor would probably be the most usual; although, in a naval




**An instrument for directing bombs from aeroplanes.**

battle, aeroplanes would be able to do much to harass the enemy. A few well placed shrapnel exploded above the gunners would not tend to increase their accuracy, and, better, smoke bombs exploded to the windward would do much to destroy accuracy of aim. Then a high explosive would be used, and, unless protective decks are materially strengthened, would be terribly effective. Authorities to the contrary notwithstanding, the writer holds that a steel projectile filled with 200 pounds of high explosive, striking with a velocity of 500 feet per second, even though it should not penetrate the protective deck, would work terrible havoc to a battleship. Present development points to the early construction of aeroplanes that will be able to carry a load of 1,000 pounds to a height of a mile and remain there for several hours.

On the other hand, those who have studied the question carefully believe that an aeroplane flying at heights greater than one mile will be a very difficult target, indeed, for gunners on the ground. Some of the reasons for reaching this conclusion are as follows:

1st. The aeroplane is not confined to movements in a horizontal plane, but may move in any plane. Those familiar with the subject know that, in order to hit a moving battleship from a seacoast gun, it is necessary to plot ahead and lay the gun ahead of the ship, just as a shot gun is held ahead of a duck. With a swiftly moving and, probably, zig-zagging aeroplane, it will be much more difficult to plot speed and direction and lay ahead than in the case of a battleship.

2nd. The difficulty of accurate aiming in high angle fire is generally recognized.

3rd. Refraction, or the bending of light rays from a rarer to a denser medium, will complicate matters.

4th. Projectiles fired at a very high angle, especially at aeroplanes hovering over an army in the field, will return to the vicinity from which fired, whether the target is hit or not.

5th. An aeroplane in close quarters would probably drop smoke bombs to obscure the enemy's vision, on the principle of the cuttlefish.

However opinions may differ, the rapid development of the aeroplane for military and naval purposes, especially in Europe, behooves us to consider it most seriously in the problems of seacoast and canal fortification that now confront us. We like to boast of our splendid isolation, of the steel throated monsters that guard the entrances to our harbors. Suppose, for instance, that, ten years hence, every battleship is equipped with flying machines; also, that an enemy's fleet appears fifty miles off New York. Would it be necessary to pass our forts in order to destroy the metropolis? Hardly; a fleet of aeroplanes would be despatched; within an hour they would be over the city; obeying wireless orders from their commander, they would maneuver over the thickly built section and soon it would be a mass of flames. Fantastic? Possibly so; but, in view of the recent extensive and successful use of the aeroplane in European maneuvers and, also, of the fact that other nations are spending many millions of dollars for aeronautical purposes, it might not be unwise for our Congress to depart from its usual policy of economy by appropriating a million dollars to enable the army and navy to fully test this new arm. Nations, as well as individuals, are sometimes penny wise and pound foolish.

A careful study of the problem of dropping projectiles reveals a certain relationship to the problems presented in mortar fire. In mortar fire, the theoretical trajectory of the projectile is a parabola, as shown in Fig. 1. Neglecting atmospheric resistance, the ascending and descending halves of the parabola are equal and symmetrical. The apex of the trajectory is a point at which the vertical component of the muzzle velocity has been used up in overcoming gravity and only the horizontal component remains. From this point the projectile falls with an acceleration due to gravity and, theoretically, would strike a target on a level with the muzzle of the gun with the same velocity it had when it left the gun. It is evident that, if an aeroplane should be moving on a level with the apex of the trajectory considered and in the vertical plane containing the trajectory, with a velocity equal to the horizontal component of the muzzle velocity, and should, at the apex, drop a projectile of the same weight, size and shape as that of the mortar, the projectile thus dropped would take the identically same path and strike with the same velocity as the mortar projectile. In other words, the problem is similar to that of mortar fire and only one-half of the trajectory has to be taken into account.

Briefly considered, the mathematical aspects of the problem are as follows: If an aeroplane, moving horizontally *in vacuo*, with a velocity of, say, 20 meters per second, should release a projectile at a point, *A*, Fig. 2, the projectile would take a parabolical path whose form and equation would be determined entirely by the height of the aeroplane and its speed with respect to the surface of the earth. The general equation of such a parabola is readily calculated and is, $x^2 = \frac{2v^2}{g}y$; in which $x$ is the horizontal distance in front of the target at which the projectile must be released; $y$ is the height above the ground; $v$ is the velocity of the aeroplane with respect to the ground; $g$ is the constant of gravitation for the particular place. Knowing all the factors in the second member of this equation, the value of $x$ is readily found. This gives a right angle triangle, *AOT*, Fig. 2, in which, knowing $x$ and $y$, the angle, $\alpha$, at which a line of sight (telescope) in the vertical plane containing the target must be set in order to strike the target, *T*, can be readily computed. Each velocity of the aeroplane and each height will, when substituted in the above equation, give a different triangle and, con

sequently, a different value for the angle, $a$. Substituting for every possible height and every possible speed will give a series of values for this angle which may be easily tabulated.

This discussion has considered the projectile *in vacuo*. It is apparent that the resistance of the atmosphere will depress the trajectory, as shown by the dotted lines in Fig. 2. Consequently the table above referred to would have to be corrected for atmospheric resistance and additional correction-tables constructed for winds and hygrometric conditions. Such correction tables would be relatively simpler than similar tables used in artillery and naval practice.

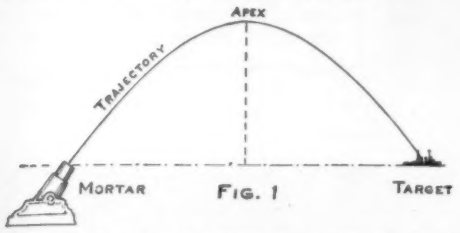


FIG. 1

A patented device, of which the writer is the inventor, takes scientific consideration of all the factors that enter into this problem. This device consists of a series of concentric rings universally mounted (that is, mounted on gimbals at right angles to each other). The center of gravity being considerably below the center of support, the inner ring assumes a horizontal position when symmetrically loaded. A telescope, with graduated arc and vernier, is mounted on the inner ring at right angles to the plane of the ring. The line of sight of this telescope therefore describes a vertical plane when revolved, enabling the operator to lay off the angle, $a$, for the particular height and speed used. Consulting Fig. 2, it is evident that, when the line of sight intersects the target, $T$, the projectile should be released.

In order to solve the equation above given, it is

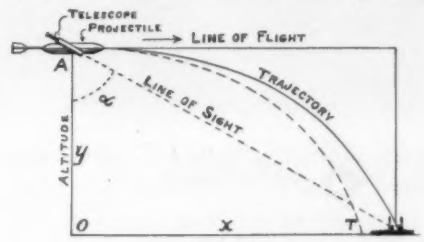


FIG. 2

necessary to know $v$, the velocity of the aeroplane *with respect to the ground*. There is no instrument for measuring this velocity; it can, however, be readily determined by using the device above described.

Consulting Fig. 3, it may be seen that, when the angle $a$ is 45 degrees, the distance $y$ equals distance $x$. Therefore, in order to determine the speed over the ground, set the telescope at 45 degrees from the vertical and fly horizontally. Knowing the height from the barometer, note when some conspicuous object, as a tree, crosses the field and start a stop-watch. Then revolve the telescope to a vertical position and continue the flight to $B$, at which point the tree will again cross the field. At this point, stop the watch.

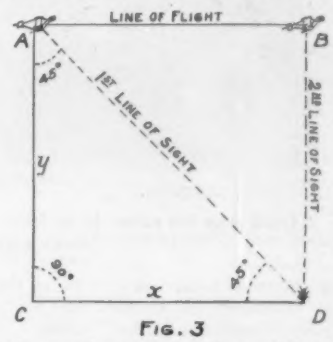


FIG. 3

The speed over the ground will equal the height divided by the elapsed time. These speeds may be tabulated by taking all possible heights divided by all possible elapsed times. It is apparent, also, that the whole operation will take scarcely more than a minute unless the height is very great.

# The "Hawke"-"Olympic" Collision

## Experimental Investigation of the Cause or the Disaster

By Robert G. Skerrett

THE British naval authorities and the officials of the White Star Line are seemingly bent upon withholding from the public the essential facts regarding the collision between the "Hawke" and the "Olympic" on the 20th of September. Were the commander of either ship undoubtedly at fault in the handling of his vessel, it is not at all likely that the present policy of silence would be preserved, and this naturally suggests that there were conditions contributive to the mishap which were, in a degree, either unsuspected or beyond control of the commanding officers. This suggested a line of investigation which, while not exactly new, is at present not thoroughly explored.

In April of 1908 the "Prinzess Irene" and the steamer "Parima" were outward bound in the lower bay of New York. The "Prinzess Irene" was bound for Europe, while the "Parima" was steaming for the West Indies. The two ships were at least 200 feet apart, but following a comparatively narrow channel. Just before reaching a certain buoy, the "Prinzess Irene"—the bigger craft—began to lap upon the stern of the leading "Parima." Suddenly, the latter vessel was drawn to starboard and toward the "Prinzess Irene," while her bow fell off to port despite her helm and engines, and her head grounded. There was no collision. Some hours later the "Parima" was gotten off, but she was found to be leaking, and repairs costing about $40,000 were needed before the ship could put to sea.

It was claimed at the time that the mishap to the "Parima" was due to suction set up between the two vessels in motion while proceeding on the same course. As a result of the unusual mishap Naval Constructor D. W. Taylor, U. S. N., carried on a series of experiments at the Government Model Basin in Washington. In substance, Naval Constructor Taylor found that when the overtaking ship began to overlap the other the disturbing force was of slight moment: there actually appeared to be a repulsion at both bow and stern, and, strange to say, the repelling force acting upon the stern appeared to be greater than that exerted upon the bow of the following vessel—causing the stern of the latter to turn in toward the leader. As the over-hauling craft continues to creep up, the bow suction grows stronger, and the repulsion of the stern of this ship lessens—becoming, in fact, attraction when the two boats are abreast. Carrying the action through its natural sequence—the two boats proceeding—Naval Constructor Taylor discovered that there was a reversal of effects as the overtaking vessel assumed the lead: the bow suction diminishing rapidly while the stern pull became stronger—the latter reaching a maximum when the midlength of the overhauling boat was something like two-tenths its length ahead of the midships of the overtaken vessel. These disturbing forces are particularly potent in shallow waters, and the experiments at the navy yard in Washington were made under circumstances of depths which were calculated to diminish rather than magnify the measure of the suction as compared with the circumstances of ships passing through the ordinary channels approaching harbors. Naval Constructor Taylor found by his model trials, when the two boats were in the position described by Prof. Reeve, that the forces of attraction and repulsion were, in effect, directly opposite, i. e., the bow of the overlapping boat turning in toward the midlength section of the craft still in the lead.

The correctness of Naval Constructor Taylor's conclusions can easily be verified and understood even if one has not at his disposal a model basin for actual tests. In Fig. 1 we have a pipe of variable diameter through which water is flowing in the direction of the arrows. At the points of maximum diameter, $P$, $P$, we have the full pressure of the head, while through the contracted section, $V$, we have increased velocity but *diminished* pressure. Bearing the simile of this pipe and the varying pressures due to changes of diameter in mind, we can easily trace the action of the forces at play between two vessels where one is overhauling and overlapping the other. In Fig. 2, the smaller ship is within a short distance of the bigger leading one and abaft the beam of the latter. Both vessels being in motion, the effect of the stream-line forces is a counterpart of current sweeping sternward. The hulls of the two ships form for us the adjacent walls of the pipe, while the relative nearness of the bottom on one hand and the water's surface on the other box in, so to speak, the stream-lines. At the point $V$ we have a restricted passageway for the current and, hence, reduced pressure and increased velocity of flow. This action may possibly be augmented by the propeller wake of the big ship. At point $P$ we have full pressure acting against the starboard bow while on the port bow at $V$ there is a loss of pressure. Naturally the bow swings to the left and the stern in the opposite direction, drawing the smaller overtaking boat toward the larger one.

*Fig. 1.*

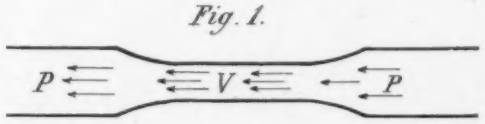



*Fig. 2.*

*Fig. 3.*

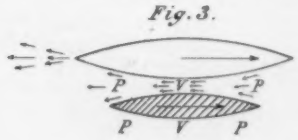



*Fig. 4.*

**Diagram illustrating the "Hawke"-"Olympic" collision and its cause.**

The accounts of the movements of the cruiser "Hawke" just prior to her collision with the "Olympic" seem to agree that the warship was crowded toward the liner and brought approximately into the position indicated by Fig. 2. The "Olympic" is a vessel of 45,000 tons displacement, while the "Hawke" is about one-sixth as large and of much lighter draft. It is easy to understand how the cruiser would be drawn toward the liner under these circumstances, and even though the commander of the "Hawke" did throw his helm over, the hydrostatic energy at work would be more than the latter's rudder could offset within the time available—especially if the warship were making considerable speed. In Fig. 4 we see what followed, and this bears out what Naval Constructor Taylor found to be the case with his models.

Fig. 3 shows us how the forces are distributed when the two vessels are directly abeam. The space between the two boats is a counterpart of the condition indicated by the pipe in Fig. 1. Assuming $P$ to have the same force value in each instance, while $V$ is an indication of reduced pressure, it is not hard to understand how the resultant is a movement of the smaller vessel bodily to port and toward the bigger overweighted by $P$, $P$, $P$. It is not necessary to confuse this problem with the crests and hollows of neighboring waves formed by the ships in motion. In fact, the vessels need not be moving at speeds high enough to disturb the water to this extent in order to arouse the suction needful to draw the vessels toward one another.

It is quite likely that the disparity in size between the "Olympic" and the "Hawke" may have contributed to the disaster, because there was also a considerable difference in size between the "Prinzess Irene" and the "Parima." In the experiments made at the Washington Model Basin, the models were of identical displacements. It is fortunate that the collision between the warship and the liner occasioned no loss of life; and if it were due to suction—even admitting imprudence on the part of the naval skipper—it is but another object lesson on a large scale of the care that ought to be taken under circumstances of this sort. We must not forget the immense size of the "Olympic" and the majority of the ships now engaged in transatlantic passenger and freight service, nor must we overlook the steady development of speed in these big vessels. Undoubtedly, both of these factors have an important bearing upon this question of suction, and these craft should be given a wider berth when in motion. The mishap is fruitful of valuable suggestions, and, at the same time, it brings us to a realization of the stupendous energy latent in the water when the balance or equilibrium of the stream-lines is once disturbed.

# A Landsman's Log A
# ship "North Da

By J. Bernard

*This landsman's log is written by the Editor of the S azine Naval Number to appear early in December, which with the Naval Number issued during the Spanish War. written entirely by prominent officers of the Navy, each a The leading article, moreover, will be from the pen of the Navy. The illustrations will consist of special photograph practice of the Atlantic Fleet on the Southern Drill Groun*

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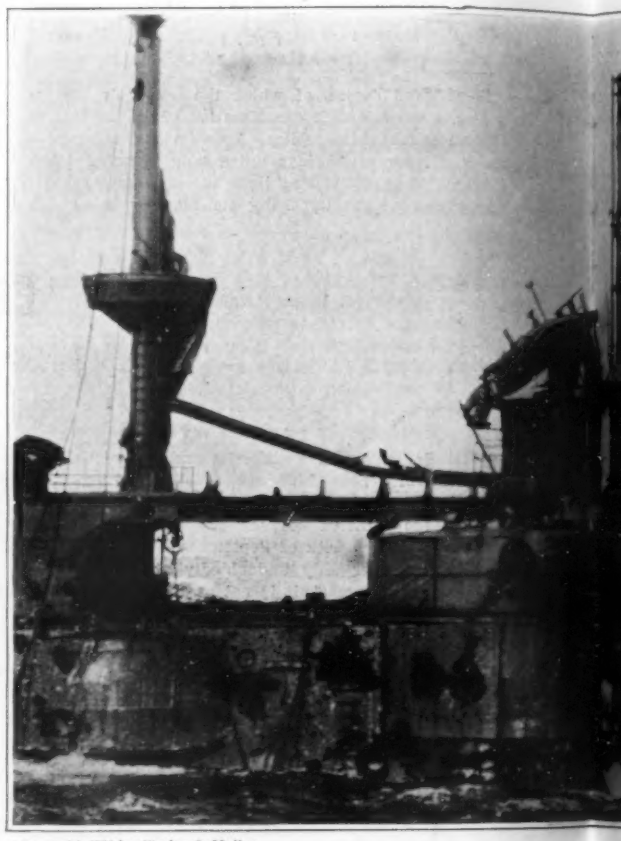
**"Crash goes the salvo, to be followed some twenty-five seconds later by the truly splendid spectacle of many giant geysers spurting high around the target."**

"THE Admiral authorizes you to go aboard the 'Michigan' to witness the firing of the 'Delaware' against the 'San Marcos.' Boat leaves the starboard gangway at five o'clock." I rub the sleep out of eyes that are heavy with that slumber which only the sea can give, and turn to see an orderly disappear with a wireless message in his hand. Where am I? Why is the gray dawn coming through a square hole in the ceiling, instead of through curtained windows in the wall? And why is that wall circular? Ah, yes, I am aboard the "North Dakota," and the circular wall at the foot of the bunk is the 10-inch barbette armor of her No. 1 turret (the officers' quarters are forward on this ship) and that "window" is a square light in her forecastle deck; and those two black cylinders that I see above it are the forward pair of twelves and—ten minutes later I am gulping down a cup of coffee with half a dozen of our officers who have been detailed to the "Michigan," whence they will observe with critical eyes the success or failure of the one particular rival of the "North Dakota"—her twin sister the "Delaware."

So we tumble into a steam cutter and a few minutes later are on the quarter deck of the "Michigan," whose gun tompions (plugs which close the muzzles of the guns) have already been decorated with the coveted red pennant with a black ball in the center, which is carried by the ship that has made the best gunnery score in the annual Spring battle practice. The firing on the "San Marcos" is to be carried out (as are all the major gun practices of our fleets) with a close approximation to battle conditions; and she will steam past the target "in division," that is to say, she will form one of a line of four ships, with the "Michigan" leading her. The wisdom of this policy must be evident to the veriest tyro—it means that, if ever the test of actual battle comes, it will present conditions with which the ship's company are largely familiar; the vital difference, of course, being the din and shock of such shells of the enemy as may land upon the ship. In the opinion of many naval officers the sound of shells that strike one's ship will be no louder than the stupendous crash of the ship's own salvos; and the shock to the ship as a whole of a striking shell can be no greater, surely, than that of the discharge of her own guns, which, I noted, shook the huge bulk of the ship as by an earthquake, and made the masts, in the tops of which I stood, whip to and fro, for a moment, like reeds shaken in a wind. (This vibration lasts but a second or so. Long before the shells reach the target the platform is perfectly steady for observations by the spotters.)

But here, drifting lazily across our bow, comes the "Delaware," fresh from the Coronation Review, where she ranked as the largest and most handsome of the assembled warships. Stripped for action and with the light of dawn glistening down the long, lean length of her, this shapeliest of battleships looked for all the world like a huge torpedo boat destroyer! The "Michigan," her anchor home, gets under way, and passing to starboard of the "Delaware," leads her out to the course, two other battleships falling in astern to complete the division. We steam past the "San Marcos," leaving her some miles to port. Soon we are fifteen thousand yards from the mark and still dropping her astern, while the far-distant fleet resolves itself into a confused group of smoke-enshrouded masts and smokestacks. Still we keep going, until observations show the sunken ship to be some twelve to thirteen miles distant. The speed is raised to 15 knots, and a faint feather of foam parts at the stem and flows by the keen cutwater of the "Delaware" 350 yards astern. Then, over goes the helm and around swings the "Michigan," leaving a broad band of curiously foaming and twisting water in her wake. Splitting this in its exact center, the "Delaware" follows, and in a few minutes we



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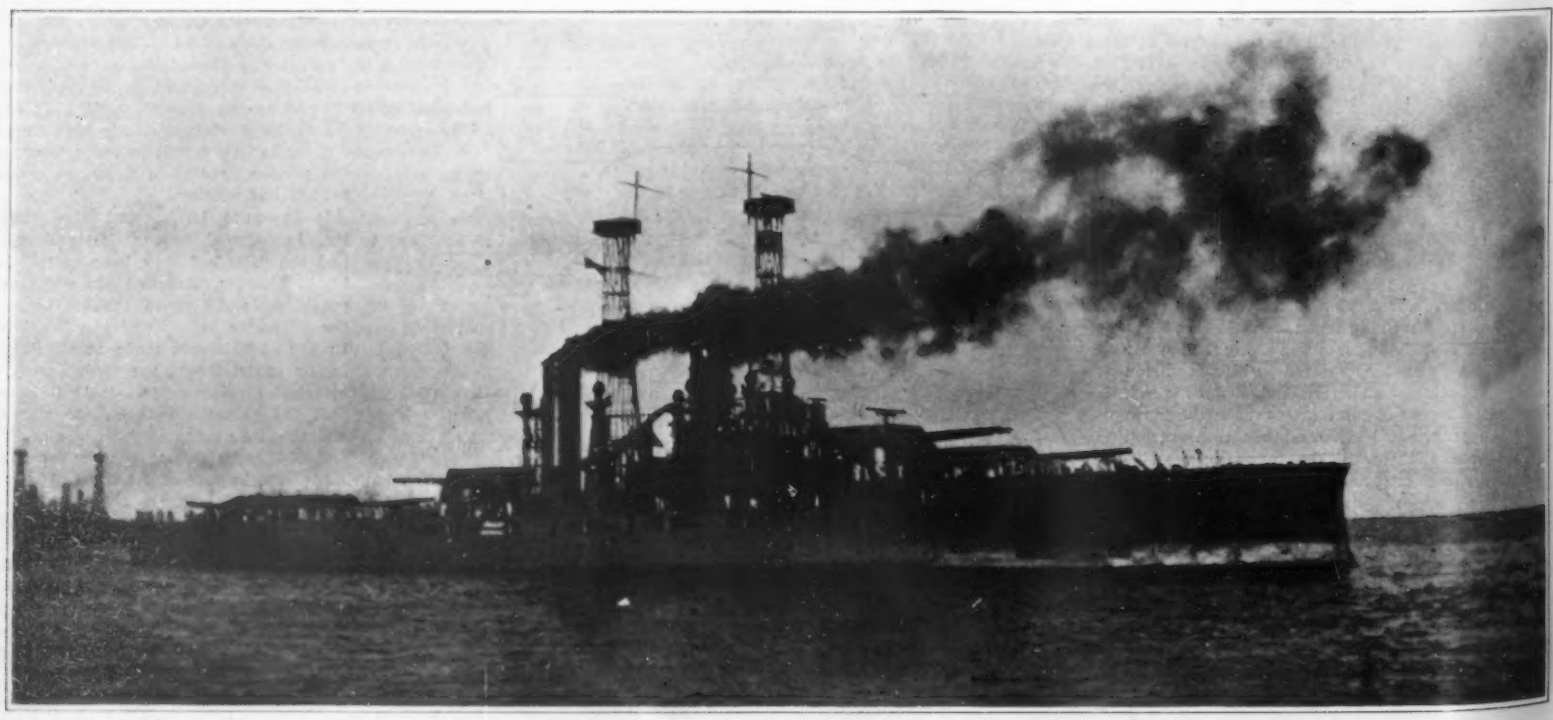
**"Poor old 'Texas'! At one time it looked as if your only mission in the fleet navy and out. Well—you redeemed yourself in the Spanish war, and tion which you have furnished as to the inability of your fa of modern ordnance.**



**"But here, drifting lazily across our bow, comes the 'Delaware,' fresh from the Coronation Review, where she ranked as the largest and most handsome of the assembled warships. Stripped for action, and with the light of dawn glistening down the long, lean length of her, this shapeliest of battleships looked for all the world like a huge torpedo-boat destroyer!"**

# Log Aboard the Battle-rth Dakota"—II.

J. Bernard Walker.

*Editor of the* Scientific American *as a preliminary to a mag-cember, which will be comparable in its size and completeness Spanish War. In one respect it will be unique, for it will be e Navy, each a specialist in the particular field that he covers. the pen of the Hon. George von L. Meyer, the Secretary of the cial photographs taken during the recent maneuvers and target ern Drill Grounds.*

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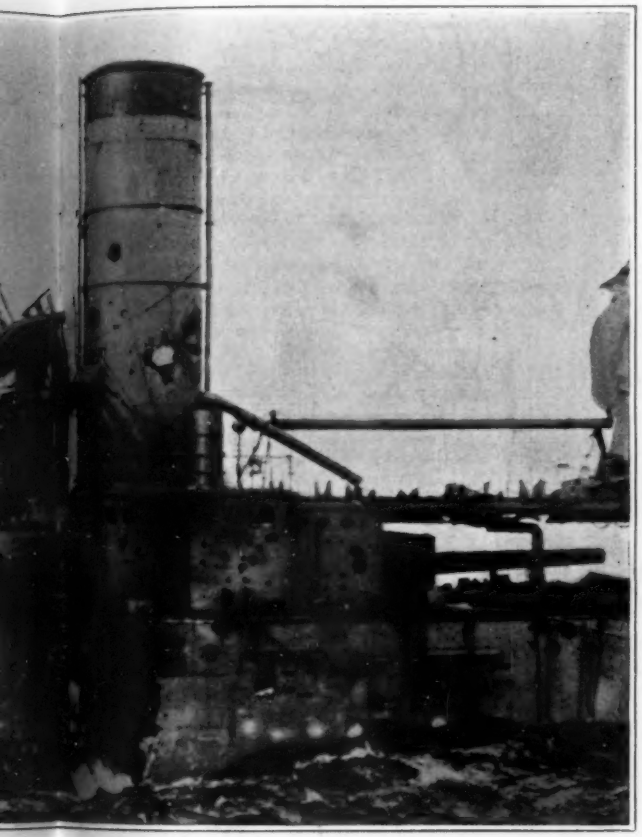
**"The 'Delaware,' in hitting the 'San Marcos' at eight to ten mile ranges, had done incomparably finer shooting than the whole fleet at Santiago at a two-mile range."**



**ission in the fleet was to get into trouble, and stand as the butt for jests inside the Spanish war, and you have more than redeemed yourself in the informa-ability of your fabric to stand up under the mighty hammering modern ordnance."**

are straightened out on the course.

And now the range-finders are trained upon the faint blotch that marks the position of the "San Marcos," and they tell us that we are some twelve miles from the target. The observer calls out the decreasing distances: "Twenty thousand yards." —"nineteen thousand, five hundred yards." "That is eleven miles," I say to myself, "and she won't be firing her ranging shot for another five or six minutes at least." But, glancing at the ship, I notice one of her forward 12-inch guns is rising slowly to near the maximum elevation of fifteen degrees. "Can it be possible that she is going to open up at a range of over ten miles?" I ask of a young ensign who is sharing a perch with me half way up the after cage mast. I am reaching for my camera when, white and swift as any lightning stroke, there burst a flash of flame from the gun, and the "ranging" shot is off on its ten-mile flight through the air. Up go our glasses on the distant "San Marcos." There is a wait of half a minute (it seems to one's tense nerves more like half an hour) when, apparently right at the wreck, there spurts up a vast geyser of snow-white water 200 feet into the air!

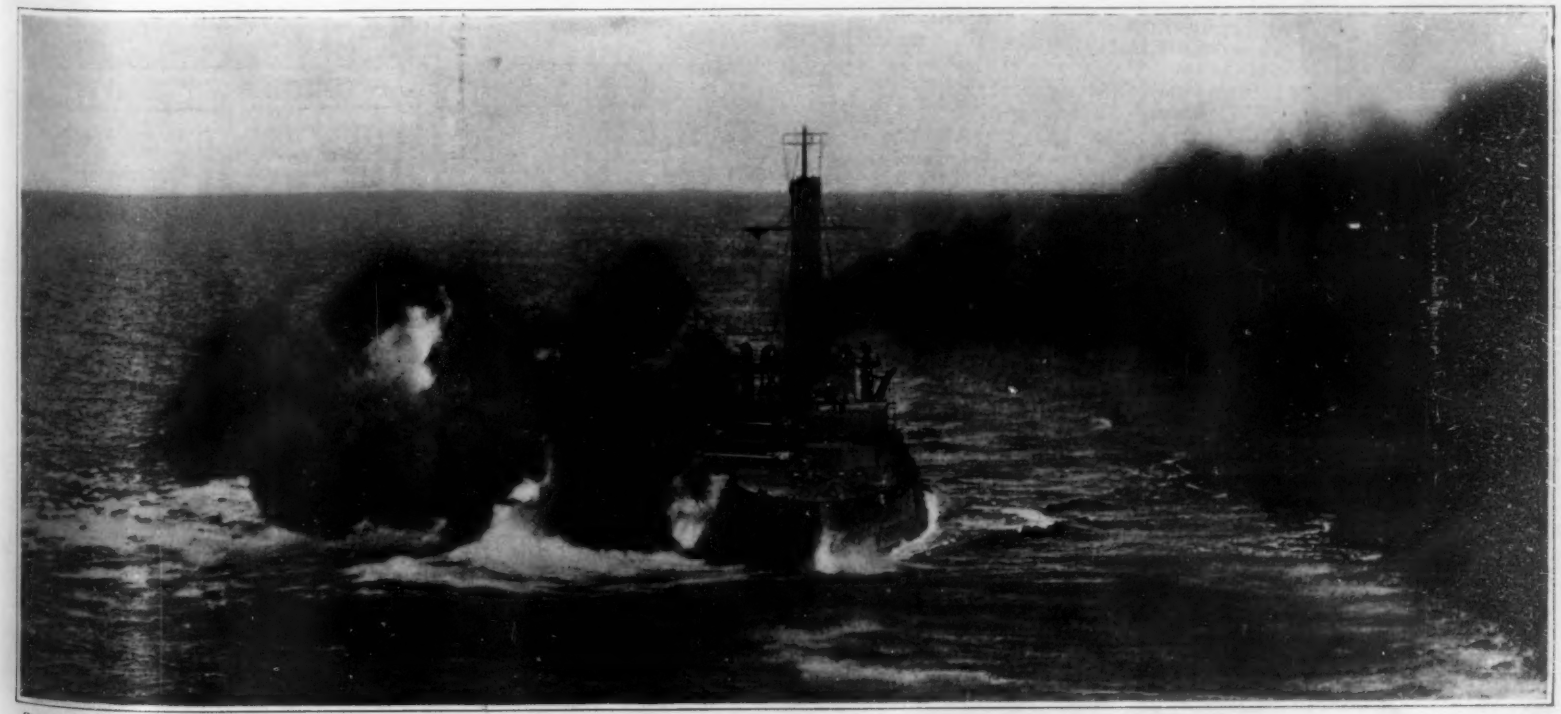
The observers on the "Panther," which was anchored one thousand yards astern of the "San Marcos," stated that this trial shot landed only 75 yards short of the target! Think of the marvel of it all! Nigh upon half a ton of steel launched into the air from a point about nine or ten miles distant, after describing a vast parabolic curve, drops within less than 100 yards of the object aimed at! Then comes another flash—another long wailing cry of the swiftly-spinning projectile —and another splash, this time one hundred yards over the target. And now for the salvo. One sees the ten 12-inch guns, which project across the starboard deck, move up like the black antennæ of some Brobdingnagian monster, as if feeling their way to the target. Crash, goes the salvo, to be followed some 25 seconds later by the truly splendid spectacle of many giant geysers spurting high around the target. Fast and furious come the flash and the roar of the discharges. Now it is the foremost pair of twelves; then the aftermost; then a four-gun, and then a six-gun salvo. Over half a hundred shots are fired, all within a period of a few minutes, and many of them with an interval of only 30 seconds between rounds.

For the second time that day the courtesy of the Admiral is extended, and the ship's cutter takes me over to the "San Marcos" for an inspection of the damage done on this and other days of firing. As I neared the old vessel, my mind went back to a visit made thirteen years ago aboard this ship, at the close of the Spanish war, when her captain took me down to the gun deck and showed me how the blast of her port 12-inch guns had dished the deck above, and showed me also the hole in her port bow, through which a shot from La Socapa battery at Santiago had entered the gun deck and caused one of the very few gunnery casualties of the war.

Poor old Texas! At one time it looked as if your only mission in the fleet was to get into trouble, and stand as the butt for jests inside the navy and out. Did I not see you one morning in the Brooklyn navy yard, lying ingloriously on the soft ooze of the dock bottom, into which you had deliberately settled in the night, as the result of some one having left open one of your sea cocks. In those days, about everything in the calendar of mishaps that can occur to a ship seemed to come your way. Well, you redeemed yourself in the Spanish war, and you have more than redeemed yourself in the information which you have furnished to the Service, regarding the inability of your fabric to stand up under the mighty hammering of modern ordnance.

As I climbed aboard, it came to me that the last time I trod the main deck it was in the company of that fine officer of the older school, Capt.

*(Continued on page 398.)*



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**"The din of shells that strike one's ship will be no louder than the stupendous crash of the ship's own salvos; and the shock can be no greater, surely, than that of the discharge of her own guns, which, I noted, shook the huge bulk of the ship as by an earthquake, and made the masts, in the tops of which I stood, whip to and fro, for a moment, like reeds shaken in a wind."**

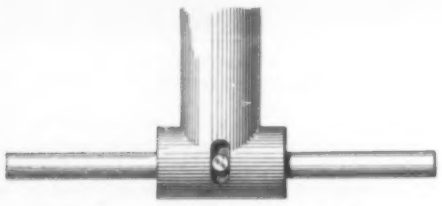
# Suggestions for the Workshop

## Ingenious Expedients of Resourceful Mechanics

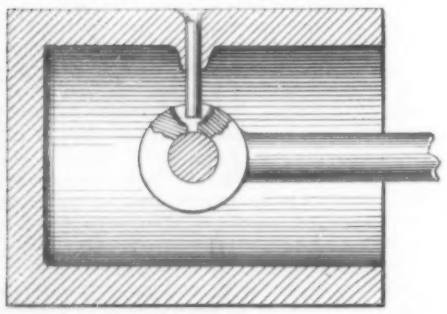
### Lubricating a Wrist Pin

By F. E. Keller

OWNERS of gas engines, who have the horizontal type, where the wrist pin is oiled by the cylinder lubricator by way of a hole through the shell of the piston, will in some makes of engines find much



The ovai oil hole in the wrist pin.

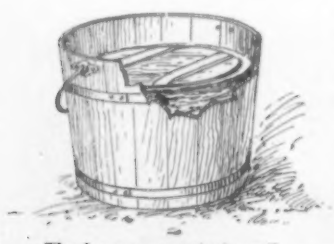


Section through the wrist pin.

difficulty in keeping the wrist properly oiled, thus resulting in excessive wear and a continuous knocking. The writer having had this experience, made use of the following kink, which worked perfectly. The hole in the piston was drilled out, and a brass tube of proper length was fitted into it, as shown in one of the drawings. The oil hole in the connecting rod was cut to an oval shape to allow for the swinging movement of the rod. In operation the brass tube directed the oil down to the bearing, thus doing away with the splashing out ordinarily caused by the rapidly moving engine.

### Carrying Water on Moving Trains or Boats

RAILROAD men frequently carry pails of water in the caboose and baggage cars. The motion of the cars would cause the water to slop, did they not employ the kink here illustrated. On the water is laid a thin board circular in shape and a little smaller in diameter than the inside of the pail to prevent pinching or jamming. When the baggage master desires to wash his hands he simply presses down the board with his knuckles or finger, which gives him all the water he needs without removing the board. This scheme for carrying water in a pail could be used to advantage on a cruising boat or a motor boat.

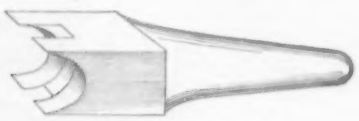


The baggage master's pail.

### A Spur Chuck for Wood Turning

By William Grötzinger

WHEN the ordinary chuck is used on small pieces of soft wood, there is a tendency for it to split the wood at its center. A spur chuck for soft wood, which will do away with splitting, can easily be made



Spur chuck for small work.

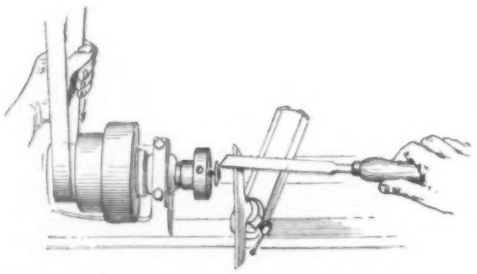
according to the drawing. A round channel is filed in the end of the square body of the chuck, and a rectangular channel is filed crosswise. The four spurs thus formed have plane parallel outer surfaces, while the curved inner surfaces serve to compress the wood between them, instead of cracking it apart as in other chucks.

### Removing the Waste on the Wood Turner's Screw Chuck

By F. B. Albert

WHEN the wood turner is turning drops or thin rosettes which are fastened on the screw chuck, there is not much wood left to grasp in removing.

The wood turner, with the chisel resting on the rest, catches the point in the outer part of the rosette



Removing a rosette from the chuck.

on the back side of the lathe. With a quick pull on the belt with his left hand he revolves the lathe backward which readily unscrews the rosette from the chuck. All the stub pieces which are left on the chuck from other turnings are removed likewise.

### Removing a Plug from Blind Holes

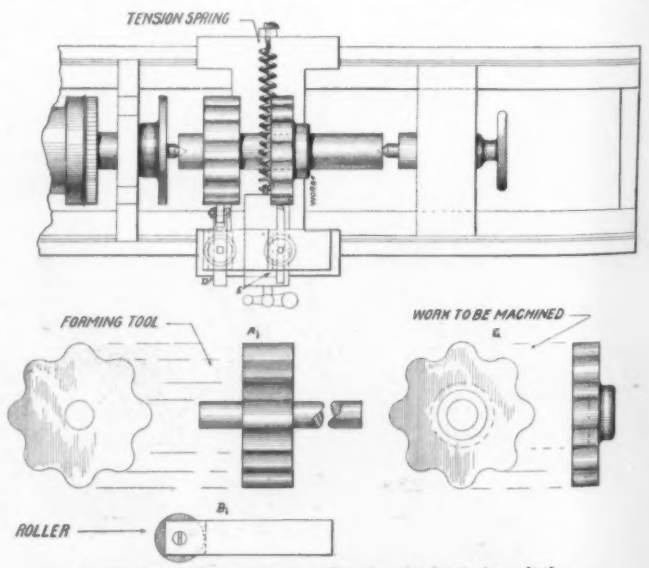
THE shank of a drill chuck was twisted off close to the end of the chuck, and it was quite a problem to get the end of the shank out, so the following little kink was tried: A ¼-inch hole was drilled endwise through the broken piece. The hole extended through the plug into the open space at the bottom of the hole. The hole was then filled with oil, and a ¼-inch pin was made, so it would slide freely therein. The pin was placed in the hole, and then was struck a heavy blow with a hammer, causing the oil that was at the bottom of the hole to force the plug out.

### Turning Scollop Hand-wheels in a Lathe

By H. D. Chapman

THE accompanying engraving shows a practical little kink for turning scollop hand-wheels in a lathe. The writer once had a large number of hand-wheels to be made as shown at *C*. The wheels were made of bronze and were cast. The outside diameter was to be machined so the job would look mechanical and it required too much time to file the wheels up, so this tool was devised.

The forming tool *A* was made of machine steel to the exact finished size of the hand-wheel. A roller *B* was made of tool steel, and was of the same diameter as the radius of the scollop in the hand-wheel. Some slight changes were necessary in the lathe to accommodate the working of the tools. The feed screw on the cross-head of the lathe was removed and a coil spring was run from the cross-head of the lathe to the back of the carriage. This spring was made of No. 10 B. & S. wire, which was strong enough to control the cutting of the tool. A double tool post was rigged up and placed on the cross of the lathe carriage. The work was then mounted on the mandrel of the forming tool and placed on the center of the lathe; the roller *B* was placed in the tool post as shown at *D*; the lathe tool *E* was then secured in the opposite tool post *E*, and the lathe was started up. The roller *B*, which is shown in position at *D*, would roll over the scollop on the forming tool *A*, and by so doing would feed the lathe tool into the work in the same manner. A very neat finish was done on the hand-wheels in this manner in less than half of the time it would take to file them to a finish.




Arrangement for turning scollop hand-wheels in a lathe.

### Facing Off an Elbow

By Albert F. Bishop

THE mechanic at times has very awkward things to hold while machining—an elbow for instance. The elbow is first placed in the chuck as in Fig. 1. A 2-inch L would need a short piece of shafting about three-quarters of an inch in diameter, sawed to a bevel on one end to fit roughly the outside sweep of

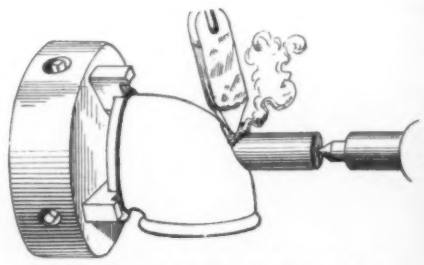


Fig. 1.—Attaching a shaft to the elbow.

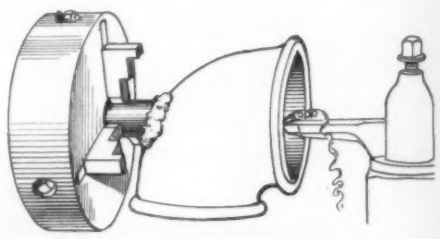


Fig. 2.—Facing the elbow.

the elbow. The other end should have a center, which the tail center holds central while the beveled end is tacked with solder to the brass or malleable iron elbow. It is then removed from the chuck, and the soldering is completed. Fig. 2 shows the short piece of shafting placed in the chuck, which holds the elbow firmly enough to face the flange ends and bore out or cut a new thread if desired.

### Workshop Notes

**Soapstone for Babbitt Casting.**—When casting babbitt in molds or pouring babbitt boxes, powdered soapstone dusted in the molds or aperture for receiving the babbitt will very much improve the flow of metal, and you are quite sure of getting a full box or perfect casting.—L. M.

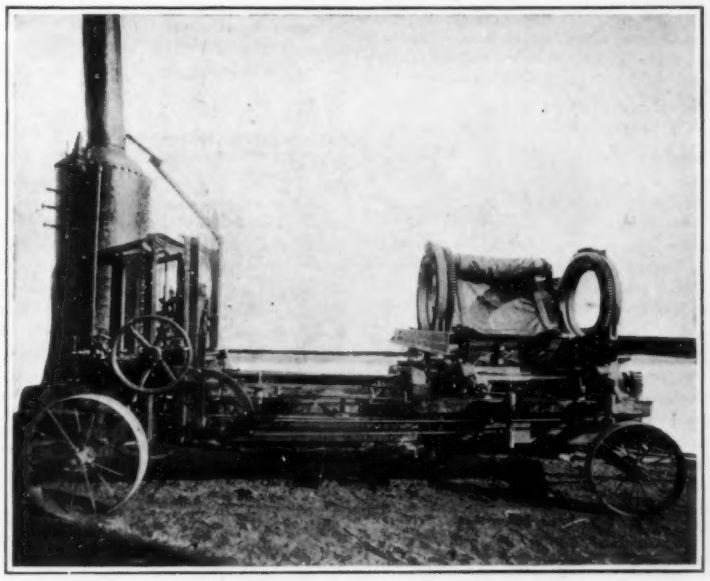
**Preparing Metal for Painting.**—In preparing for painting iron or metal which is quite smooth, or has been machined, say, for instance, a cylinder head, take raw oil and moisten a cloth so that a very slight amount of oil can be rubbed over the surface of the machined iron. Be particular not to get on too much, as it should be thoroughly dried before the paint is applied. It will take several days or a week for it to dry sufficiently. This preparation keeps the paint from chipping.—A. F. B.

# The Inventor's Department

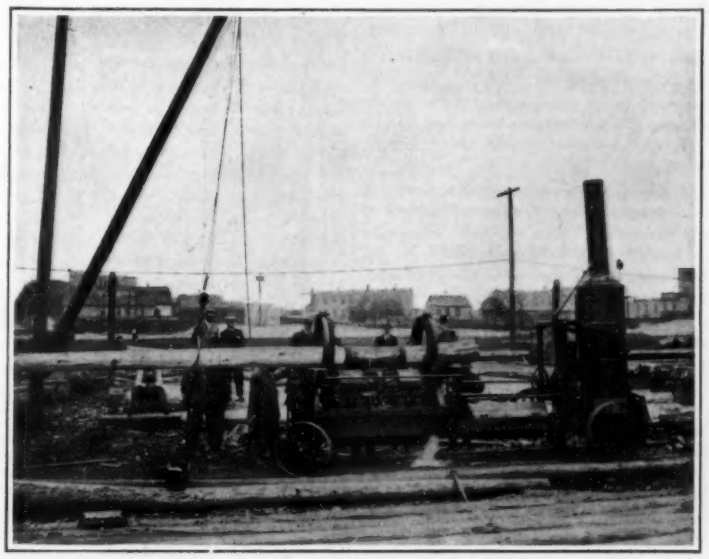
Simple Patent Law; Patent Office News; Inventions New and Interesting

## Machine for Treating Poles With Preservatives

IT is at, or near, the ground line that a pole is most subject to decay, for here it is exposed to the moisture of the ground and to the air as well and hence provides an excellent breeding place for destructive insect life. In order to preserve the pole against decay, it is unnecessary to treat more than a limited zone in the neighborhood of the ground line. Recently a machine has been perfected by which the pole may be thus economically and expeditiously impregnated with creosoted oil, or other preservatives. The oil is forced into the wood by means of air pressure. The machine, as shown in the accompanying illustrations, is provided with a boiler for generating steam with which the air compressor is operated, and with which steam coils are heated to warm the oil that is stored in a reservoir in the middle of the machine. A pair of iron skids will be observed extending crosswise of the machine, and upon these the pole is supported. Two iron rings, shown in the illustration, may be opened to admit the pole, after which they are closed by operating a hand wheel. A spool, bearing a canvas band three feet wide, is then revolved by a hand wheel so as to wrap the cloth tightly about the pole. The edges of the band are reinforced to make a snug fit and they are subjected to air pressure, so that the band will form an airtight annular bag about the pole. This done, the heated oil is introduced into the bag through a pipe under a pressure of about five pounds to the inch. It has been found under test that a 10-minute treatment is sufficient to force about a gallon of oil into the pole. The oil is forced into the wood to an initial depth of three-sixteenths of an inch, but it continues to penetrate the wood after the pressure is relieved, and at the end of a few days reaches a depth of about one-half inch. After the pole has been treated, the spool is revolved to unwrap the cloth band from the pole, the rings are opened and the pole is rolled off the opposite end of the skids. A pan is located under the band to catch any oil that may drip from the cloth, or that might ooze out through checks in the wood during the treatment. The machine shown in the illustration handles poles from seven to twenty-four inches in diameter.



Machine for impregnating poles with creosote



Applying the preservation in a limited zone.

## The Heany Tungsten Lamp Cases

ONE of the most interesting decisions in the history of the United States Patent Office has recently been handed down by Hon. Cornelius C. Billings, the First Assistant Commissioner, culminating a long and arduous series of hearings and examinations before him, the taking of testimony of many witnesses and the delivery of arguments by many noted counsel.

The investigation of the Heany applications was altogether unique so far as precedent in the Patent Office was concerned. It was the direct outcome of the famous Heany criminal trial, in which John Allen Heany, Ned W. Barton and Henry E. Everding were tried for fraudulent manipulation of records in the Patent Office. The applications involved the alleged invention of tungsten filaments for incandescent lamps, and for the process of making filaments from metals in a collodial form.

Certain specific charges made by Principal Examiner A. F. Kinnan, of Division 37 of the Patent Office, were the basis of the investigation, concerning applications serial numbers 238,769, 332,786 and 344,068, filed by John Allen Heany; of charges relating to the said Heany application No. 238,769, and its alleged divisional application No. 344,068, set forth in the petition of Hans Kuzel, who is involved with Heany in interference No. 27,073, and of charges concerning said Heany's application, No. 238,769, and its alleged divisional application, No. 332,786, set forth in the petition of Kuzel, Just and Hanaman, and von Bolton, who are involved with Heany in interference No. 27,074.

It was charged that Everding, a patent attorney, and Barton, an assistant examiner, in the year 1906 removed from the parent Heany application, certain sheets of the original specification and substituted other sheets, containing matter not in the original specification, when filed in 1904, and the matter contained in these substituted pages, it was alleged, was compiled by Barton, from information gained through his position in the Patent Office. It was charged that Heany aided, abetted and connived at the acts of Everding and Barton in this fraudulent substitution.

It having been shown that Barton and Everding were guilty of fraud, and they having been punished therefor, Barton having confessed before the criminal trial, and Everding being convicted, and, although Heany himself was acquitted, the charges made in 1909 by Examiner Kinnan led to the institution of the very exhaustive investigation which has just been finished, and which occupied a period of about one year. The investigation had for its purpose to decide whether, in view of these substitutions and changes, valid patents could be granted, or whether the applications should be expunged from the files on the ground that they were fraudulent.

The taking of testimony was commenced before the First Assistant Commissioner of Patents on July 25th, 1910, all parties being represented, and was continued from time to time, and finally concluded April 21st, 1911. Respondents were given ample opportunity to cross-examine the witnesses produced in support of the charges and to rebut their testimony, and availed themselves of that opportunity. Voluminous testimony was taken by both sides which was supplemented by stipulation into the record of certain testimony previously taken in the criminal trial.

This proceeding grew out of a condition of affairs in the Patent Office which has occurred for the first time in its history. So free from fraud or allegations of fraud has the Patent Office been, that no statute or rule of practice is found to cover specifically such a case. The effort of the First Assistant Commissioner was to learn by due process of law, the truths surrounding the case and to render a judgment based upon those truths in accordance with the law.

Jurisdiction of the case was acquired by virtue of the general supervisory authority of the Commissioner of Patents over affairs in the Patent Office, its records and papers, which empowers him to grant valid patents upon legally effective applications therefor, or else to refuse to grant patents upon applications therefor, which are shown to have no foundation in law, and which patents, if granted, would, in his opinion, be null and void.

The gravity of the charges preferred against the Heany applications by Examiner Kinnan, and the tremendous commercial value of the inventions involved, the control of which, upon the granting of patents would undoubtedly cause millions of dollars annually to accrue to the profit of the owners thereof, led to the absolute necessity for the discovery of priority of invention, and, if possible, to decide without a vestige of a doubt, which of the contending parties was entitled to status in the interference.

In his decision in this proceeding, Mr. Billings said:

"It would be a travesty, indeed, and against all legal principles to permit a party to an interference to remain a party thereto, should it be found that the very applications of that party involved in the interference are fraudulent to such a degree that no valid patent could be granted based upon such applications, or, in other words, that any patent or patents granted upon such applications would be invalid and void on the ground of fraud. A fraudulent application is in law no such application as to justify the grant of a patent thereon, and the same is true when an application contains an incomplete and inoperative disclosure."

During the progress of the investigation it was urged on behalf of the respondents that the question as to whether or not John Allen Heany was privy to the fraudulent practices concerning his applications, was *res adjudicata* because of Heany's acquittal in the criminal court of the District.

The Court of Appeals of the District of Columbia, which is the court of final resort in patent jurisdiction, and is also the court which hears and determines appeals in patent cases from the decisions of the Commissioner of Patents, held that the power of the Commissioner to declare that the altered application is not "the application contemplated by the statutes as the foundation of the patent," was not "barred by the adjudication in the criminal case," and said:

"If he (the Commissioner) finds the alterations to have been made, but without knowledge and consent of the applicant, he will permit it to be corrected so as to restore it to its condition as originally filed."

And also:

"If, on the other hand, he finds that it was tampered with by the connivance and approval of the applicant, he will probably enter an order rejecting the application, leaving the applicant his right to appeal therefrom."

After fully and exhaustively considering the citations offered by the respondents, the First Assistant Commissioner held that the question of Heany's complicity in the frauds charged is not *res adjudicata* in the proceeding.

Mr. Billings touches briefly in his decision upon the introduction during the investigation of a mass of evidence by Heany, which was subsequently found to be manufactured under Heany's direction, for the purpose of proving that he (Heany) had invented a pure tungsten filament incandescent lamp prior to December 29th, 1904, the date of filing of his application, No. 238,769, and to substantiate the contention that he had no motive whatever in perpetrating the frauds specified in the charges and admitted by respondents in their answers, to have been made in said application.

During the investigation it was largely due to the efforts of the First Assistant Commissioner that the spurious nature of this so-called evidence was discovered, in which efforts he was greatly aided by the counsel for the respondents, who were unaware of the character of the evidence, and who demanded that the witnesses

whom they had presented should tell the entire truth, no matter how damaging in effect it might be for their clients.

It, therefore, transpired that instead of showing that Heany could have no motive to perpetrate the frauds alleged, the evidence introduced, on the contrary, shows that Heany did not have a conception of the invention of the issues within the meaning of the patent law, prior to the filing of his application on December 29th, 1904, and that he did have a decided motive in attempting to obtain the benefit of that date for knowledge subsequently acquired.

The decision of the First Assistant Commissioner, therefore, in effect orders the dissolution of the interferences Nos. 27,074 and 27,073, as to the party Heany, and directs that the amendment present to the parent application of Heany, No. 238,769, filed December 29th, 1904, be refused entry and the application finally rejected, and a patent on that application finally refused on the ground that any patent granted thereon in view of the established facts would be held in the courts to be null and void and of no effect, on the ground of fraud.

The amendments presented in the "tungsten division" application, serial No. 332,786, filed August 31st, 1906, are refused entry and the application is finally rejected and a patent thereon is finally refused, on the ground that any patent granted thereon in view of the established facts would be held in the courts to be null and void and of no effect, on the ground of fraud. Similar action is taken with regard to the "colloidal division" application, No. 344,068, filed November 19th, 1906, and the amendment thereto.

The First Assistant Commissioner further ordered that upon the termination of the proceeding, each of the three Heany applications shall be endorsed with the words "Patent refused on the ground of fraud," and each of them shall hereafter be kept in the archives of the Patent Office, separate from the other applications for patent.

The inventions involved in the issues not only of the Heany applications, but in those of the interfering parties, are perhaps among those which claim the greatest public interest. The tungsten lamp, which is being universally adopted and which combines a higher efficiency with a lesser cost than the ordinary carbon filament incandescent lamps, is a possession the control of which is well worth the terrific legal struggle which has taken place both within and outside of the United States Patent Office.

## Notes for Inventors

**Some New Gayley Steel Process Patents.**—James Gayley of New York city has secured a patent, No. 1,002,576, for apparatus for drying air by refrigeration, and patents, No. 1,002,577 and No. 1,002,578, for methods of drying air, both of which include the refrigerating idea.

**Short Claims in a Patent.**—Patent No. 1,002,648, to Fred B. Corey of Schenectady, N. Y., assignor to General Electric Company, for a relay contact, is interesting because of the brevity of its claims. It has two claims, the first containing only six words and the second only seven words, the second claim being identical with the first except for the addition of the word "malleable."

**An Alarm for Cash Box of Pay Telephones.**—In patent No. 1,002,232, to William E. Davison and Robert McAlpine of Detroit, Mich., is shown a telephone instrument and a cash box for the telephone and having a lock with an electric alarm which operates when the lock is unlocked or when the telephone instrument is detached.

**A Cool "Bite" for Infants.**—Women with teething babies will be interested in a patent, No. 1,002,364, to Josiah H. Bridges, which shows a cooling receptacle and a hollow, imperforate mouth-piece whose interior communicates with that of the cooling receptacle so that the mouth-piece which the infant bites will be kept cool, and the receptacle has a non-conducting jacket which prevents the infants hands from coming in contact with the cold body portion.

**Women in the Patent Office Examining Corps.**—One woman represents her sex on the examining corps of the Patent Office. For some years Mrs. Noyes and Mrs. Lybrand were assistant examiners and became well known to most practitioners before they resigned their positions some years ago. Now the only woman on the force is Miss Marie K. Saunders, a native of Missouri. She was assigned to the Patent Office August 3rd, 1901, as a copyist at a salary of $900 per annum, being appointed from Guthrie, Okla. January 11th, 1907, after passing the rigid Civil Service examination for the position, she was appointed a fourth assistant examiner at $1,200 per annum, her salary being increased by operation of law on January 1st, 1908, to $1,500. On November 1st, 1909, she was promoted to be a third assistant examiner at an annual salary of $1,800 and still holds the position.

**Helping the Dentist.**—A number of dentists have spoken to us about the desirability of an improved cement for certain classes of dental work, such, for instance, as setting inlays. It should be transparent, strongly adhesive, insoluble in the liquids of the mouth, quick setting, and be non-irritant to the pulp of the tooth. They also referred to the need of a gold preparation which can be worked with the same speed and facility and under the same conditions as the ordinary silver base alloys, or amalgam. Another thing desired by dentists is an abscess syringe, so constructed that it may be used in any position in the mouth for injecting fluid medicaments through the roots of teeth into abscess tracts. It should be so formed that the needle can be packed in position in the desired root with the barrel in such relation to the needle that pressure can be made in the barrel at a distance from the mouth and without force or strain upon the needle.

**Ancient Inventors and their Secrecy.**—It is an interesting fact that the inventors of ancient times, while appreciating public patronage, described the uses and merits of their inventions instead of explaining the operations and principles thereof. In other words, while they enlarged upon the great things that could be accomplished by their inventions, they carefully concealed the means and modes of operation by which the results were to be accomplished. In the early days patents were often regarded as unrighteous monopolies and the patentees were held in great contempt. This prejudice would probably never have existed if patents had been confined to new inventions, but in those days exclusive grants were obtainable to control the manufacture and sale of the commonest articles in daily use. So objectionable did this practice become that the wrongful monopolies were held up to public ridicule and an old writer, Maitland, says in the "Antimasque of Projectors rode a fellow upon a little horse with a great bit in his mouth, and upon the man's head was a bit, with headstall and reins fastened, and signified a projector who begged a patent that none in their kingdom might ride their horses but with such bits as they should buy of him. Then came another fellow with a bunch of carrots upon his head, and a capon upon his fist, describing (representing) a projector who begged the patent of monopoly as the first inventor of the art to feed capons with carrots, and that none but himself should make use of that invention; and have the privilege for fourteen years, according to the statute."

**Inventions Ahead of the Times.**—Frequently inventions are made before the time is ripe for them to go into general use. This is illustrated in the so-called fireless cooker which has recently come into popularity and is now used to a great extent. The fundamental idea of this cooker is not at all new, the apparatus in its main features being described in Ganot's physics as a Norwegian stove, no illustration, however, accompanying the description, at least in the edition we examined. Patents were also granted many years ago, both in the United States and England, for fireless cookers. In the English patent, No. 778, of the year 1857, a Frenchman, Joseph Francois Maires of Paris, describes the invention as consisting in putting the food to be prepared for eating with water and suitable condiments, in a cooking vessel of the digester kind, which vessel is placed on the fire and the temperature is raised as high as two atmospheres or about 121 deg. C., indicated by a suitable valve, fitted on the lid of the vessel. When the valve is raised and steam escapes, the vessel is taken from the fire and put in a double wrapper case which is packed with suitable insulating material, and the cooking keeps on until it is completed by the confined heat, sometimes five or six hours or more. In this form of cooker, the food is brought to a cooking heat in the vessel before the latter is placed in the insulating casing. In a United States patent, No. 59,441, of 1866, expired long since, the cooking vessel is placed in the insulating casing with a chamber around the vessel and in which chamber hot or boiling water is placed so the heat from the water will slowly cook or stew the meat or vegetables placed in the vessel. This old idea is somewhat similar to that pursued in some of the modern cookers in which radiators in the form of plates are heated and placed in the casing adjacent to the vessel containing the food to be cooked. Most of the earlier patented cookers describe the apparatus as adapted for use as a refrigerator as well as a cooker.

**A Swinging Emery Wheel.**—A very interesting and novel feature to be seen in a few of the most advanced machine shops is a swinging emery wheel. The wheel and the motor which drives it are mounted together and are suspended from the ceiling and the lower part of the wheel is exposed while the upper portion is shielded by a hood for the protection of the workmen. The outfit is suspended by means of a bar, on one side of which is the motor which balances the emery wheel secured at the end of a four-foot shaft. The apparatus may be raised or lowered to any desired height to suit the character of the work, and as it is thus suspended, the operator manipulating the wheel by two arms extending from the hood, it is possible to move the wheel over an area of eight feet. This installation is designed principally for the purpose of finishing heavy pieces of work which cannot be readily moved back and forth over the stone. The connection between the motor and the wheel is direct, and as there are no belts or chains, this advantage is great. The device is intended to withstand hard usage. By this arrangement delays due to belt failure are entirely avoided.

**A New Automobile Fire Engine.**—The Springfield fire department has displaced a team of three horses, formerly attached to one of the water towers, and this piece of apparatus is now drawn to and from fires under power without any further alteration or change than the removal of the front wheels. For this purpose a "tractor" is made use of which is a sturdy little motor, mounted on a truck, adapted to support the front end of the water tower, and equipped with a motor of sufficient power to draw it rapidly to the scene of action. In order to permit of its making very short turns and of winding through narrow thoroughfares, the front wheels of the tractor are mounted so close to each other that it has the appearance of a single large wheel.

**Automatic Gas Cocks.**—Although we frequently read of deaths from accidental gas suffocation, it is found that many patents, probably several hundred, have been granted for devices for automatically shutting off a gas cock if the gas be blown out or accidentally extinguished. An early, if not the first, patent for this subject is the patent, No. 74,440, to Smith, issued February 11th, 1868, and long since expired.

## RECENTLY PATENTED INVENTIONS.

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

### Household Utilities.

CLOTHES DRYING FRAME.—J. W. HORNER, Chicago, Ill. This invention supplies a frame for use within the confines of a dwelling. It is particularly arranged to elevate the drying frame and the articles suspended thereon from the floor, and if the room in which the frame is installed permits, above the heads of the occupants of the room to allow persons to pass beneath the frame and the clothes.

### Electrical Devices.

INDUCTION COIL.—J. MCINTYRE, Jersey City, N. J. In this improvement in induction coils an adjustment of the contacts is obtained in an effective manner, according to the use to be made of the apparatus and relative to the existing strength of the source of electrical energy, the arrangement rendering the employment of the expensive platinum contacts exceedingly economical. It relates to electrical apparatus in Letters Patent of the U. S., twice granted to Mr. McIntyre. He has also invented another induction coil, and it relates to electro-magnetic apparatus, its object being to provide certain improvements in the Ruhmkorff and other types, whereby a non-rotatable contact is bodily moved with its bearing on the bridge or post, to bring this contact in proper relation to the opposing contact and to securely lock the movable contact and its bearing in the adjusted position against accidental movement.

### Of General Interest.

APPARATUS FOR PRODUCING VARIOUS SOUND EFFECTS FOR THEATRICAL AND LIKE PURPOSES.—A. H. MOORHOUSE, Victoria Works, Bayley Street, Stalybridge, England. This invention relates to apparatus for producing various sound effects for theatrical and like purposes, the apparatus being particularly advantageous for use in combination with kinematographs and the like for imitating the sounds that would be produced in the scenes that are being depicted. The details may be varied to suit particular requirements. It may be operated by one or more electric motors with switches or control handles for the different effects.

MAIL BOX AND CARRIER.—H. A. SCHULTZ, Dorchester, Wis. This invention has in view a box in which the mail is well protected from the weather and readily introduced and removed; and further and principally resides in the mounting of the box so that it is accessible to the carrier without leaving the road, and also accessible from the premises at a substantial distance from the road, the box and its carrier offering no substantial obstruction to travel along the road, but adapted to swing from a position overhanging the road to a reversely extending position.

PEANUT ROASTER.—L. ROSENKRANZ, Rhinebeck, N. Y. This invention pertains to roasters for peanuts and like products, and has reference more particularly to a device of this class, which comprises separable casing sections, a roaster removably mounted between the sections, and a burner under the roaster, the casing having a warmer therein above the roaster.

SHOEMAKER'S JACK.—F. O. ROLLINS, Newburyport Mass. In this case the improvement refers to shoemaker's jacks, and the object is to produce a jack having great durability, which will be adjustable so as to change the height at which the shoe is held, and also to enable the shoe to be held either at the right or at the left side.

FLASH LIGHT APPARATUS.—H. J. PAUL and F. KLEIN, New York, N. Y. This invention refers more particularly to photographic and like apparatus which comprises a support, a frame carried thereby, an envelop supported by the frame, for confining the smoke and other products of combustion of the flash-light material, and a slide mounted upon the support and connected with the envelop, so that the last can easily adjust itself to the expansion due to the explosion.

TRAY.—C. A. ANDERSON, East Orange, N. J. The front end of the tray extends upwardly at an obtuse angle relatively to the bottom of the tray to form an abutment which will normally retain slips of paper in the tray, while readily permitting the user to slip the uppermost slip of paper over the inclined front end of the tray by placing the thumb against the extension of said front end formed to retain a pencil, and his first finger on the uppermost slip of paper.

SOLDERING APPARATUS.—W. W. FARNSWORTH, Brushton, N. Y. This invention refers to improvements in devices for soldering parts, especially parts of jewelry, optical goods, etc. It provides means by which two small parts may be held rigidly, while the soldering is conducted. It provides a small pad of heat insulating material, which may be held in the hand while parts to be soldered may be securely held upon the pad by devices which may be

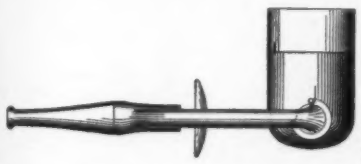
easily manipulated to release or retain the parts to be mended.

METHOD OF DISINFECTING BOOKS.—I. H. HOOD, 113 Poplar St., Greenville, Miss. This method consists in spreading or opening the leaves of the book by a blast or current of air, and in simultaneously delivering to the spread or opened leaves a disinfecting substance by the same current of air. The books may, however, be treated in the same manner, separately or in lots, by passing the blast backward and forward over the books, and by reciprocating the books through the blast or current of air.

FEED TROUGH.—W. RANDALL, Los Angeles, Cal. The object in this instance is to provide a simple and inexpensive trough wherein but a small amount of food is exposed at once, and wherein as the exposed food is removed the supply is renewed. A constant supply of food is obtained. Four kinds may be fed at once.

FENCE POST.—J. E. HUSSEN, 526 Hoffman St., Hammond, Ind. The intention here is to provide a means, cheap in construction and of readily separable parts, whereby the post is strengthened at the point where the greatest amount of wear and tear occurs, whereby a neat finished construction is obtained, and whereby a positive connection is made between the wires and the post.

TOBACCO SMOKING PIPE.—SAMUEL E. CREASEY, Alfred, Maine. This invention provides a stem for a pipe pivotally connected to the bowl thereof to permit the swinging of the bowl to a position parallel with the stem; provides in the pipe a bifurcated extension for the stem to form a yoke for the bowl; and provides an automatic cover for the bowl operative when the same is disposed in housed



TOBACCO SMOKING PIPE.

position. The invention forms a double armed stem section having in one or both of the arms the necessary smoke channel, which unite to form a single channel for the mouth piece, and in pivotally connecting the arms and bowl. It provides a convexed cover guidably mounted in structure of arms and springs actuated to normally extend into the path of the pipe bowl when swung to housed position. The illustration presents a side view.

COLLAPSIBLE CONTAINER.—T. F. TANSEY, 447 W. 14th St., New York, N. Y. This invention pertains to a container of a type adapted to contain cigarettes or the like. It can be made from less material and with less trouble than those now on the market. The container can be collapsed as the articles are used, so that a bulky package need not be carried about when the container has therein only one or two of the articles.

MINIATURE GREENHOUSE.—F. W. SCHWARZ, 492 S. 3rd St., Columbus, Ohio. This device can be made in any size required and put into use in any garden or field. The parts thereof are hinged to one another so that the whole structure can be taken down and stored away so as to occupy a minimum amount of storage room.

### Hardware and Tools.

PIPE WRENCH.—W. L. BESSOLO, Box 522, Birmingham, Ala. The invention consists of a handle upon which is mounted a jaw member so that it has a limited degree of rocking movement. With this jaw member is pivotally connected a jointed member exteriorly toothed to interlock with a spring-actuated pawl also pivotally mounted on the shank member adjacent the rocking jaw member. When the last is moved in one direction the co-operating jaws are made to tightly grip the pipe interposed between them through means of the pawl, while when the rocking member is moved in opposite direction the space between the jaws allows the wrench to be turned on the pipe to get a new hold.

MARKING TOOL.—J. A. WICKES, 54 Broadway, East Somerville, Mass. This invention provides a tool with marking faces having corresponding oppositely extended distinguishing features; provides in a marking tool a plurality of hammer heads bearing distinguishing marks identifying the character being printed; and provides for a tool for accurately and quickly distinguishing the correct position of the character imprinted.

SHEAR GUIDE.—T. H. SUMNER, 1631 Washington St., San Francisco, Cal. The object here is to construct a device whereby a blade is held in adjustment against a sharpening stone in such a manner as to allow of a free swinging movement of the edge of the blade across the sharpening stone. The inclination of the blade on the stone may be varied at will, and held at its adjusted position. Means are provided whereby the stone will always be kept in contact with the edge of the blade.

### Machines and Mechanical Devices.

PULLEY AND BEARING THEREFOR.—M. H. AVERY, Dover, N. H. This invention provides oiling devices for pulleys arranged for continuous circulation of oil from the center to the end of the bearing and return; provides a construction for pulleys whereby is avoided dropping of oil from the pulley or bearing therefor; and provides an oil distributing and lubricating bearing for a loose pulley.

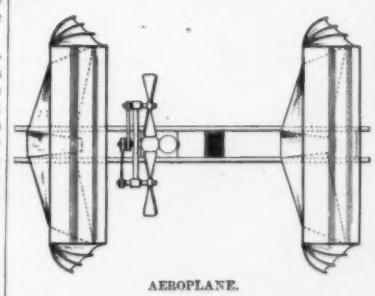
SUGAR BOWL.—J. MATAS, Paterson, N. J. The purpose here is to provide a bowl designed for use in restaurants, hotels and other places where sugar is placed at the disposal of patrons; and having mechanism inside the same to enable the sugar to be readily and easily discharged from the bowl into a glass or other receptacle without necessitating the use of spoons.

FLYING MACHINE PARACHUTE.—J. W. DOLSON, New York, N. Y. It is one of the objects of this invention to provide a parachute which will correspond to a lifeboat on a water vessel, and enable the aviator to detach himself safely from the aeroplane in case of accident to the latter. The parachute may be extended and let out any distance from the aeroplane, so as to aid in supporting the same, if necessary, and to act as an air anchor.

COPING MACHINE.—J. G. BENSTER and H. L. BENSTER, Moline, Ill. This invention has reference to cutting and punching sheets and bars, and its object is the provision of a new and improved coping machine more especially designed for shaping the ends of I-beams, channel beams and other beams used in structural steel work, to insure close fitting of adjacent members at an angle of 90 degrees or less, as the case may be.

FLYING MACHINE.—M. G. ADAMS, Parsons, Kan. This invention more particularly relates to a machine in which a steering surface, such as a rudder which is manually or otherwise operable, is controlled by a further surface which is free to move under the influence of air pressure thereagainst. The stability of flight of the machine is automatically controlled. Mr. Adams has invented another flying machine, in which is provided a steering surface or rudder; and a controlling surface operatively connected with the steering surface and arranged to move bodily under the influence of air pressure thereagainst, and in which machine stability of flight is controlled automatically.

AEROPLANE.—PETER ZAMPOL and CHARLES ZAMPOL, New York, N. Y. Address PETER ZAMPOL, 358 Cortlandt St., Belleville, N. J. This invention relates to aeroplanes, and an object is to provide supporting planes of such construction that they tend to maintain the equilibrium of the machine as a whole. A further object is to provide supporting planes and side planes so disposed toward one another that not only is the equilibrium maintained but each serves as a lifting or resistance element. Means are provided for protecting the ends of the supporting planes in case they should dip downwardly and come in contact with an obstacle in its path. The engraving shows a plan view.



AEROPLANE.

### Prime Movers and Their Accessories.

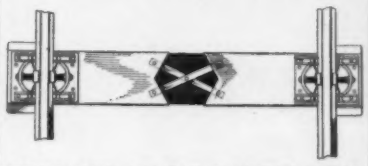
STARTING DEVICE FOR INTERNAL COMBUSTION ENGINES.—R. O. LE BARON, Masonic Temple, Portsmouth, Ohio. The object here is to provide means which may be used at will to connect an acetylene gas tank with the intake of the engine, so that the gas will mix with the explosive mixture and flow into the engine cylinder, which with a proper spark mechanism, will insure an explosion in the engine cylinder on the first, or in any case on the second, rotation of the engine shaft.

MEANS FOR COOLING INTERNAL COMBUSTION ENGINES.—R. F. E. OKRASSA, Antigua, Guatemala. In the present patent the object of the invention is the provision of a new and an improved means for cooling internal combustion engines, in a very simple and economical manner, and for this particular purpose use is made of moistened air moved in contact with the cylinder of the engine.

### Railways and Their Accessories.

RAIL JOINT.—F. C. BOTWRIGHT, Philadelphia, Pa. This invention has reference more particularly to a rail joint which comprises a base having rail-engaging means, a chair movably mounted upon the base and adapted to support the rail ends, means for causing the relative lateral movement of the base and the chair to secure the rail ends in position, and means for holding the rail ends.

METALLIC TIE AND RAIL FASTENING DEVICE.—JOEL F. ROBINSON, Central, S. C. This device eliminates the use of spikes, which split the tie, work loose, and otherwise destroy its life and causing many wrecks. The rail attachment is as well adapted to the wood tie as to the metallic one. It is made on a sheet iron or metal plate covering the end of the wooden tie, thereby extending the life and usefulness of a worn out tie and giving safety against spreading rails. The tie is automatically attached to the rail by an elliptic locking device, which holds the rail



METALLIC TIE AND RAIL FASTENING DEVICE.

immovably, guarantees an exact gage of track and releasable only by the use of a wrench. The locking device is underneath the rail and inaccessible to train wreckers. It is not liable to be disturbed by any cause until a wrench is used. The form of tie is especially adapted to elevated service and on ballast roadbeds. The invention provides for insulation, and the engraving shows a top plan view.

CAR TRUCK.—C. A. LINCOLN, Wayne, Maine. The object here is to provide trucks for railroad cars, constructed and arranged to dispose the axles of the wheels in a radial position upon the curved sections of the track in order to eliminate friction at these curves. A further object is to so arrange the trucks that any obstruction upon the track would not tend to cause the wheels to leave the roadbed.

DOOR FOR GRAIN CARS.—J. W. WHEELER, Palmyra, Neb. This invention relates to a door for grain cars, coal cars and the like. One object of the improvement is to provide a door which can be rigidly and securely fastened to the framework when in use, and may readily be swung out of the way when not in use, and further provides means for attaching the door to the framework on the car in both of these positions.

WATER-GAGE.—J. A. COOPER, Jersey City, and W. R. VAN BUSKIRK, Paterson, N. J. This invention provides a water-gage for determining the level in boilers especially on locomotives. The gage is strong and durable, and is not liable to blow out, and even if it should blow out, the fragments of glass would be caught by a protector, preventing them from flying and injuring the person or eyes of the engineer.

DOOR HANGER FOR CAR DOORS.—J. T. GRIMSHAW and L. R. WELLINGTON, Rialto, Cal. An object in this instance is to provide a hanger which will permit the car door to be easily opened and closed and which will render the binding of the door impossible. A further object is to provide a device having a novel form of adjustment for the easy opening and closing of the door, together with means for preventing wear of the attachments.

### Pertaining to Recreation.

SWING.—G. D. TUCKER, Meridian, Miss. An object of this invention is to provide a support for a swing rotatably supported on suitable rollers with means for driving one or more of said rollers by the swinging action of the swing, so that the device as a whole will move over the ground, and if desired above a common pivotal point.

GAME APPARATUS.—J. E. YOST, care Yost Yeast Co., Arkansas City, Kan. An object of this invention is the provision of a new and improved game apparatus for playing a game of checkers on a map by the use of traffic routes or lines to move on, the towns along the routes as points to move to, and towns at the end of the map as "king row." The game is highly interesting and educates in geography.

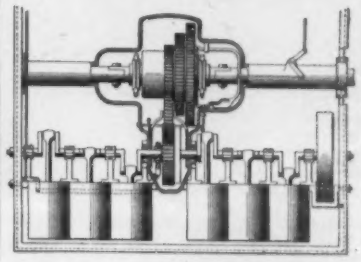
### Pertaining to Vehicles.

PNEUMATIC WHEEL.—S. P. COX, Bayport, N. Y. This inventor provides an improved construction of wheel, in which the tire is made up of separate units, each carrying its own pneumatic cushion, and its individual foot (or feet) associated with the cushion, the various units being removable at will and consequently interchangeable.

BRAKE LOCK.—W. S. BRISTOL, Anthony, Kan. To accomplish the purposes of this invention use is made of a brake lever for connection with a brake shoe, a locking rod mounted on the brake lever, a locking lever adapted to be engaged by the locking rod to lock the brake lever relatively to the locking lever and means for limiting the movement of the locking lever.

VEHICLE WHEEL.—J. C. THOEN, Burke, Idaho. The aim in this case is to provide a novel construction of spring wheel which will have sufficient resilience to permit its practical operation on automobiles and the like without pneumatic tires. An important feature of the invention is the coiled portions of the spokes which give greater resiliency to the spokes and thus improve the action of the wheel.

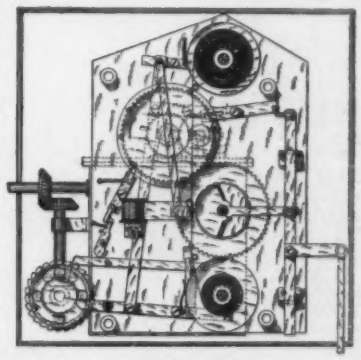
GEARING.—HOWARD G. CARR, 910 E. Main St., Hoopeston, Ill. This invention is shown in the enlarged plan view of the chassis of a motor vehicle, exhibiting the engine for driving the vehicle, and in cross section, the gearing connecting the engine and the driving axle. The object is to provide a motor vehicle in which the engine is mounted adjacent to the driving axle and is operatively connected there-



GEARING.

with by means of efficient and compact, variable speed gearing, which permits the vehicle to be driven at different speeds and in different directions, which dispenses with a shaft or chains for operatively connecting the engine shaft and driving axle, and in which the mechanism is so arranged that it can be easily assembled and taken apart and is accessible without difficulty for repair or other reasons.

TACHOMETER.—MAX HOEFT, Berlin, Germany. (Peterson & Schulz, agents.) The engraving herewith shows front elevation of entire apparatus after removing the front plate of clockwork and the front end disk of the paper roll and showing the casing in section. The actual printing motion, for example the pressing of the type against the paper on which the record is to be made, is not carried



TACHOMETER.

out by a clockwork spring or weight adapted to be wound up periodically, but either by coupling the printing mechanism with a shaft, or some other part, driven by the motor or by force of the person moving some operative part of the vehicle or motor. Printing is thus effected with the greatest certainty and the apparatus can not fail owing to insufficient force being available as can occur when a clockwork spring is used. The complicated mechanism heretofore necessary in order to automatically wind up a clockwork spring is now avoided.

DOOR SIGNAL.—L. L. BORIES, San Francisco, Cal. The object of the present invention is mainly to provide an automatically-acting indicator device actuated by the closing of the door. This device is particularly adapted for use on automobiles and other vehicles, and at all times to see that the door is opened or closed without turning his head.

SLEIGHING ATTACHMENT FOR CARRIAGES.—J. P. MCCREADY, Berlin, N. H. This attachment is for use for baby carriages, go-carts and vehicles in general, and it comprises a plurality of runners which can be suitably supported beneath the body of the vehicle and adjustably attached thereto, so that they can be raised clear of the ground when they are not needed for use, or lowered when desired to support the weight of the vehicle thereon.

### Designs.

DESIGN FOR A TEAPOT, COFFEE POT, OR SIMILAR ARTICLE.—M. WEINTRAUB, New York, N. Y. This ornamental design for a teapot, coffee pot or similar article represents a teapot of harmonious proportions and highly elaborate ornamentation. Scroll work profusely covers the entire article except the numerous scenes of pastoral and social life pictured around the lower part.

DESIGN FOR A SWIMMING BAG.—A. P. RINDSKOFF, New York, N. Y. This view of a swimming bag of ornamental design, shows an article of square form at the lower half. Half way up the sides, the bag is shaped with two graceful incisions, the top one on each side forming the bottom of a wing-like form, two of which constitute the top of the bag.

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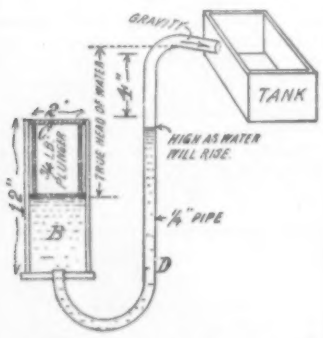
Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12555) J. F. S. asks: *B* is a brass cylinder, 2 inches diameter by 12 inches long. *C* is a plunger, weighing ¾ pound. *D* is a ¼-inch pipe connected at bottom of cylinder *B*, leading to tank 4 inches above top of cylinder. Why won't plunger *C* lift water or force it rather into box, as the plunger is much heavier than the water it has to raise? What size pipe will it require, as I cannot increase weight of plunger? A. The true height of lift in your sketch is not 4 inches, but the total height from base of plunger where it rests on water to level of bend in pipe. A ¾-pound plunger in a cylinder of 3.14 inches area (equal to 2 inches diameter) will




balance a head equal to ¾ ÷ 3.14 pounds or 0.24 pound per square inch nearly, equivalent to 6.6 inches of water (since 12 inches head of water is 0.434 pound per square inch pressure). From your sketch we judge your plunger is about 6 inches long, and that the head of water is therefore about 6.6 inches at the height to which it is shown as rising, while you would have to add ½ pound more weight to the plunger to lift it to the tank (disregarding friction). You can reduce the diameter of cylinder and plunger to 1.6 inches nearly, and the head will then just balance the ¾-pound plunger.

(12556) J. M. K. asks: 1. How much loss of power would result in transforming say 10 volts, 10 amperes, direct current into 20 volts, 5 amperes? Have you got a SUPPLEMENT describing such a transformer, and the making of same? A. A large loss would take place in changing 10 amperes at 10 volts direct current to 20 volts. It could not be changed to 5 amperes at 20 volts. There is no transformer for a direct current excepting some form of an induction coil which will give an interrupted direct current. It would be cheaper and simpler to double the battery and so get your 20 volts and 5 amperes by a suitable resistance. 2. Have you got a SUPPLEMENT describing a small voltmeter? Also a small ammeter? A. You will find a voltmeter and ammeter described in our SUPPLEMENT 1215, price ten cents. They are of simple construction and can be made by an amateur. 3. Have heard that the Mississippi River flows up hill, being driven onward by the centrifugal force of the earth? A. The expression that the Mississippi River flows up hill because of centrifugal force is not a correct expression. Water cannot flow up hill. A water level is the surface of still water anywhere on the earth. The ocean is level, but at the equator the water and the land surface also are thirteen miles farther from the center of the earth than at the poles. The Mississippi River at its source is above the level of its mouth, and the water flows down to its mouth from the source. Centrifugal force lifts the water level thirteen miles at the equator above its position at the poles. A ship does not sail up hill from New York to the equator. It goes over a water level, and neither up nor down.

(12557) I. M. says: Kindly let me know whether the wheels of an automobile on the inside or outside of a curve leave the ground when going at great speed around said curve, and why? A. The inner wheels of a vehicle leave the ground first when it overturns in rounding a corner too rapidly. Centrifugal force acts outward upon the vehicle through its center of gravity, which is above the ground. The fulcrum is on the ground through the rim of the wheels. This forces the vehicle to turn over upon the outer wheels. The outer rail of a track is raised to prevent the same effect in railroad trains. The outside of a race track is banked for the same purpose in bicycle races. The riders lean in very far in rounding the curves to prevent being thrown outward.

## NEW BOOKS, ETC.

A SHORTER COURSE IN WOODWORKING. A Practical Manual for Home and School. By Charles G. Wheeler. New York: G. P. Putnam's Sons, 1911. 8vo.; 286 pp.; 765 illustrations.

Manual training is so recent an addition to the general curriculum that its exponents are apt to be either professional teachers whose knowledge of the subject is superficial, or skilled mechanics whose ideas of teaching are somewhat crude. This "Shorter Course" is intended to help both classes, and the independent student as well. Its first division, "Common Tools and Their Uses," is very exhaustive and clear, being so profusely illustrated that the figures are often some pages in advance of the text which refers to them. The second part, "Operations in Shaping, Fitting, and Finishing," tells how to miter, dowel, splice, cleat, chamfer, and groove. This division also gives instructions for moldings, for panel and door making, and for the elementary operations in simple carved work. An appendix deals with such primary principles of construction as are embodied in gates, simple bridges, and roofs; and with practical problems in drawing and in laying out work. In every way the manual excellently fulfills the purposes with which it set out, and is a worthy follower of the same author's "Wood-Working for Beginners."

GARAGES, COUNTRY AND SUBURBAN. New York: The American Architect, 1911. 4to.; 80 illustrations.

He must be hard to please whose eye is not gratified by the garages shown in the beautiful half-tone reproductions of this album. Even Cairo, Egypt, has yielded the publishers an artistic and satisfying model, while America has apparently been ransacked for buildings that delight the artistic sense and meet the most exacting practical requirements. The plans of most of these are included, so that much help is afforded the man who is deciding on the structural features of a new garage. Some twenty preliminary pages of text take under consideration the essentials of construction and equipment, including the safe handling and storage of oils.

THE LANDSCAPE GARDENING BOOK. By Grace Tabor. Philadelphia: The John C. Winston Company, 1911. 8vo.; 180 pp.; illustrated. Price, $2 net.

Gardens do not happen, declares Miss Tabor. A perfectly satisfying garden is the outgrowth of artistic sense, careful planning, and accurate execution. In the large plates of her attractive volume are presented not only perfect vistas, but also scenes which fall just short of the effect aimed at, by reason of some too insistent feature or some subtle lack. Without dwelling at great length on the cultural side of the matter Miss Tabor treats of the country or suburban home of moderate size in relation to its setting, giving the laws that govern the arrangement of gardens, trees, shrubs and lawns as affected by the site and the house itself. In a word, she aims to clear up the whole difficult problem of making a house seem at home in its site. The utilization of natural features, the approaches, the blending of architecture and Nature, making the most of views, the garden furniture and accessories—all these phases of the subject are capably handled. The illustrations are fine half-tone plates of representative gardens and homes interspersed with practical diagrams and planting plans.

THE ICE AGE IN NORTH AMERICA. And Its Bearings upon the Antiquity of Man. By G. Frederick Wright, D.D., LL.D., F.G.S.A. Oberlin, Ohio: Bibliotheca Sacra Company, 1911. 8vo.; 763 pp.; illustrated. Price, $5.25.

The first edition of this work was published twenty years ago, but the interesting manner in which it is written, combined with the width and accuracy of its observations and the value of its deductions, makes it still a popular and standard book. Much material has been added to include the later discoveries, together with fifty new maps and illustrations. There are several chapters on glaciers other than those of North America, and the first part of the volume comprises an exhaustive study of ice and its action. The second part discusses the bearings which the studies of the first part have upon man's antiquity. As the author of "Scientific Confirmations of Old Testament History," Dr. Wright naturally leans toward an interpretation of Nature which conforms to Biblical statement, and it is his contention that recent discoveries have in no wise falsified his original reasoning and theories, but that, on the contrary, they show the date of the last glacial epoch to be really much later than it is usually represented to be. There is a bibliography covering no less than thirty pages.

THE HOUSE FLY. Disease Carrier. An Account of Its Dangerous Activities and of the Means of Destroying It. By L. O. Howard, Ph.D. New York: Frederick A. Stokes Company, 1911. 8vo.; 312 pp.; illustrated. Price, $1.60 net.

Here is a timely work on a subject intimately touching the public health and welfare. The recent increased agitation against house flies and the danger they represent is proved to be a sane warning against a very real menace. The author gives a life history of the fly and, assisted by well-executed plates that show its organism and habits, cites exact experiments in proof of its activities as a disease carrier. The array of evidence is conclusive, and most interestingly presented. The reader is then enlightened as to remedies and preventive measures. These include the prevention of breeding by treatment of all places in which breeding is possible; keeping flies out of the house; and killing them as they enter. Some ten millions of dollars are expended each year in the United States alone in an attempt to screen dwellings against the entrance of flies and mosquitoes. Another not inconsiderable item of expense is incurred in trapping and killing the pests after an entrance has been effected. With a little harmonious action on the part of individuals, Boards of Health, and communities, the breeding places might be rendered harmless and these expenses avoided. Until this comes about, however, housewives may read in the latter part of the volume of almost every device ever thought of for disposing of the mature fly. As Chief of the United States Bureau of Entomology, Mr. Howard's utterances should carry authority and inspire confidence.

WESTERHAM WITH ITS SURROUNDINGS. A Handbook to Wolfe-Land. By Gibson Thompson. New York: Frederick Warne & Co. 112 pp.; illustrated.

The quiet little Kentish village of Westerham is the birthplace of General Wolfe. Although so near London, the surrounding district is intersected by rambling paths that give glimpses of some enchanting views. The village itself is little altered since the days of Wolfe. The philology of the name carries us back ten centuries. In the Domesday Book of William the Conqueror it appears as "Oistreham." The handbook—one of the famous "Homeland" series—while serving as a brief history and general guide to the district, lays much stress upon Wolfe's connection with Westerham, sketches his boyhood and manhood, and presents pictures of the vicarage in which he was born and of the buildings and byways so familiar to him.

PRELIMINARY REPORT ON A VISIT TO THE NAVAHO NATIONAL MONUMENT, ARIZONA. By Jesse Walter Fewkes. Washington: Government Printing Office, 1911. 8vo.; 35 pp.; illustrated.

This, Bulletin 50 of the Bureau of American Ethnology, is a most instructive monograph on the important prehistoric ruins reserved under the name Navaho National Monument. These ruins are connected with Hopi pueblos still inhabited, in which are preserved traditions relating to them and their ancient inhabitants. The Preliminary Report will be followed later by a more detailed account based upon a thorough and extended examination. In the meantime we have here much material for study and some admirable photographic reproductions of the major and minor treasures already revealed. There are maps of the groupings and sketches showing detailed construction, with a map showing the surrounding country and indicating the location of the various objects of interest.

ADVENTURES IN HOME-MAKING. By Robert and Elizabeth Shackleton. New York: John Lane & Co., 1910. 12mo.; 350 pp. Price, $1.75; postage, 10 cents extra.

There is always a demand for a book which deals with the transformation of an old house into a modern dwelling. The potentialities which exist in old houses, especially old Colonial houses, is very great, and the authors of this book have performed a difficult task in an admirable manner. The finding of the home is discussed; this is followed by the planning, which begins with the library, then the fireplace and the secret stair are taken up; then the old parlors are dwelt upon, and this is followed by a description of the white-paneled dining room, the halls, the bed rooms, the guest room, and then we are taken to the outside, where a formal garden, the lawn, the shrubs, the trees, the spring house, and the stone-walled pool are all discussed. The illustrations, which are inserted apart, are excellent. There is little question but that the book will be warmly received.

THE MANUAL OF STATISTICS. Stock Exchange Hand-Book. 1911. New York: The Manual of Statistics Company. 8vo.; 1092 pp. Price, $5.

It is hardly necessary to commend the thirty-third annual issue of this hand-book to those who are familiar with earlier editions. For the benefit of such investors as may not have seen the work we may say that it is a compilation of information about railroad, industrial, and government enterprises, including all those of the United States, Canada, and Mexico whose securities are listed in the leading stock markets. Following the style of each corporation is the date of its formation and a brief history of its life to date, with a statement of its stock authorized and issued, its holdings, its earnings in the past, and its funded debt. In the case of railroads even freight traffic statistics are given, and in all cases much detail as to dividends, surplus, and depreciation is added. Other features of the manual are tables of securities showing the high and low quotations of the past three years, and statistics on mining, cotton, produce, money, and banks. This reference book should be upon the desk of every investor, broker, and man of business.

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## The Aeroplane in Naval Service

(Concluded from page 384)

the deck of this boat and returns to it. It rises obliquely or in spirals above its floating nest, and having reached a variable height, according to the lucidity of the atmosphere, it can, on a clear day, discover the presence of the enemy on a horizon a hundred miles in diameter, while itself remaining invisible and unassailable. Then it can redescend upon its ship and, by means of wireless telegraphy, send the results of its observation to the friendly fleet a couple of hundred miles in the rear. Thus, ten hours before coming in contact with the enemy, the commanding admiral would know of the presence, the strength, and the position of his opponent, and would be able to evade or attack, to join another division of the fleet, or to commence a flanking movement, etc.

At present we make use of wireless telegraphy alone. One or several scouts are sent ahead of the squadron. When they discover the enemy they are at close quarters, and even so they have a pretty poor view; they see from below, with a visual ray which grazes the sea and loses the relief, and at the same time it is necessary that they inform the commander-in-chief as soon as possible; the wireless is set to work, but it speaks without having seen or having seen but imperfectly. . . . The aeroplane, on the contrary, takes its survey overhead, undisturbed, and out of harm's way. It is the indispensable auxiliary of the wireless; it is the eye of the scout, as the radio-telegraph is his mouthpiece; the two elements complement each other; they are inseparable.

But I insist on this point, that for its present use, as yet the aeroplane of the high seas be considered only as a "giant aerial periscope"; i. e., it must not go far from its point of support, it must not get out of sight of it, so that if any vexatious motor troubles occur, the convoy may immediately hasten to the succor of the poor shipwrecked bird.

For our flying machine is not yet acclimated to extended maritime excursions, and over sea as over land the stoppage of the motor may happen suddenly. On land this accident is of minor importance; a landing is made with more or less difficulty, but the landing is made; the injury is repaired, and you depart once more.

But at sea the aeroplane which descends to the water because of motor trouble, even if provided with floats, is very probably not in a position to be repaired by the pilot. The aviator cannot leave his seat to change a spark plug or mend a feed-pipe. He cannot get off again by himself, at least with the present motors.*

. . . We have to-day flying machines, which fly as well over water as over land, if not better. Let us make use of them at once, such as they are; that is the most urgent point; and afterward we can apply ourselves to the long and arduous task of making them veritable sea birds, with untiring wings, masters of wind and wave.

And to this end what is necessary? No great thing to begin with, and above all not many operators:—a few aviators with sufficient knowledge of the technique of aviation, a few carpenters and mechanicians, a much greater number of machines, naturally, than there are pilots, a repair shop, and a judiciously chosen aviation field on the seacoast in a favorable climate. Then, on the sea, a specially equipped cruiser, two torpedo boats, or better, two motor-boat scouts, and a tug.

Maritime aviation exists already in latent fashion; to co-ordinate its elements and to know how to set them in motion would be sufficient to endow the marine with this new service which might be to it of so much assistance.

## Indoor Lighting, Natural and Artificial

(Concluded from page 385.)

that no light shall fall directly downward, and its glass sides shall be at such an angle as to deflect the entering light as much as possible away from the vertical and all of the glass surfaces should be of a quality of glass that will cause a diffusion of the light.

To make it impossible for the sun's rays to fall directly on the floor, and to direct the light toward the walls, the superstructure must have the form of a large prism, the top being entirely opaque and the sides sloping at an angle of 30 degrees. With this construction the light is admitted only through the sloping sides, it is partially diffused and its principal force is directed toward the gallery walls. The under skylight or ceiling glass gives a further diffusion and if the quality is correctly selected, it will thus practically obscure the source of light from the observer's eye and if the color of the floor is made darker than that of the walls, the result is very satisfactory and the true requirements are met without the introduction of a canopy or other objectionable screen, at least so far as daylight lighting is concerned.

The artificial illumination equipment must necessarily be of a design that gives full consideration to the fundamental principles observed in connection with daylight lighting.

Owing to our ability to direct and regulate the force of the light more readily under artificial conditions, we can, with this form produce results even more perfect with respect to diffusion and uniform wall intensity, than are possible under daylight illumination, and though perhaps not exactly reproduced, the quality and color of the daylight can be approximated closely.

For many reasons the electric lamp is the most suitable for interior lighting. A type, however, must be selected that will give a steady light and the electric wiring must be so planned as not to interfere with this condition. As in the case of the power of a water fall, the energy of light, if under control and suitably applied, will accomplish much, but if incorrectly used, its efforts may do more harm than good.

Fig. 3 is an illustration of this latter condition, from which it will be seen that two brilliant electric lamps have been placed between the observer's eye and the objects which it was intended should be lighted.

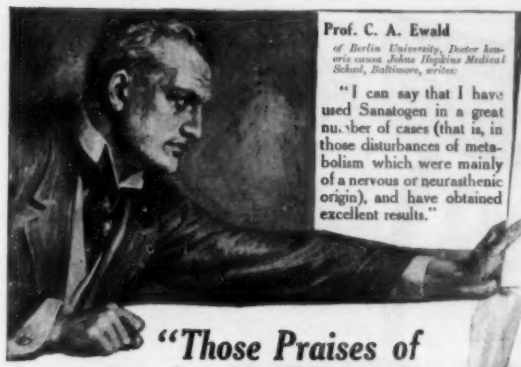
Another mistake frequently made in lighting pictures, or other similar exhibits, is to use an electric lamp in a trough reflector, the whole device being placed in front of one or more pictures, the idea being that a strong light is thus cast, and the source of light is screened from the observer's eye, all of which is true, but the effect is a very "spotted" picture. The best results from artificial lighting will be obtained when the light sources are entirely outside of the room in which the exhibits are displayed.

Figs. 1 and 2 illustrate galleries of equal size where the artificial lighting has been so arranged and where the prism-shaped superstructure has been used to provide the best natural lighting. The photograph from which Fig. 2 is reproduced was taken by daylight only with a three-minute exposure, and it is clear from the reproduction that the principles governing the best interior lighting have been well carried out in this installation.

The prism superstructure also serves another excellent purpose, for it provides a housing in which the simplest, but most effective artificial lighting equipment can be arranged. Within this space, specially constructed electric fixtures should be hung, the lamps being supported in rows, and at a uniform distance from the under glass. The fixtures themselves will thus be entirely screened, as the glass, when properly selected, will diffuse the entering light and practically nothing can be distinguished through this glass from below. The fixtures themselves being entirely screened can be made of the simplest pipe construction, thus involving a minimum of cost.

By placing a concentrating type of opaque mirror reflector just back of each of the incandescent lamps and adjusting these lighting units at a pre-determined angle, numerous beams of light will be thrown directly on the walls of the room below, and by properly calculating the location of the lamps and their number, and by giving the inner surface of the mirror reflector a double angle, thus making its sectional form approach the

* This can now be accomplished, thanks to a device mounted on the "Canard" of Voisin, by which the pilot himself can start the motor without leaving his seat.—Ed.

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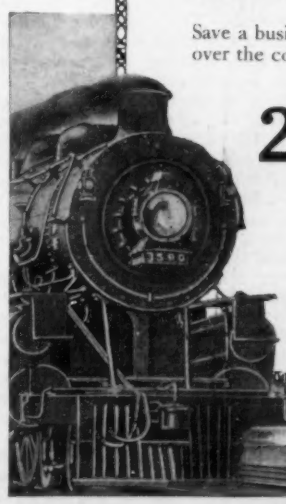

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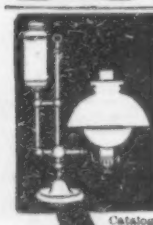
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line of the true parabola, we will obtain the greatest benefit from each unit of illumination provided.

The photograph from which Fig. 1 is reproduced was taken entirely by the artificial light provided by an overhead electric lighting equipment of this kind, and it is interesting to note that while the exposure in this instance was the same as that of Fig. 2 (three minutes) the diffusion of the light, in the case of Fig. 1 is superior to that obtained from Nature's lighting and the relative intensities of illumination of the interior surfaces of the room in Fig. 1 more nearly accord with perfect conditions, the intensity on the wall surface being almost exactly uniform throughout.

This latter result is accomplished in a very interesting way, for as stated before, the force of the light from the incandescent lamps is thrown directly on the walls, but the beams of light are so adjusted that the fringe of one overlaps that of the next, all of which in turn are diffused as they pass through the ceiling glass. An observer standing underneath the ceiling glass, looking upward, can scarcely detect the position of the sources of the light, so nearly are they screened by the underside of the opaque reflectors.

A comparison of Figs. 1, 2, and 3 brings out clearly the importance of eliminating the source of light from the field of vision and the need for a uniform intensity of illumination on the wall surfaces, also, the fact that artificial illuminating equipment can be planned for interior lighting that will produce results very closely approximating the best to be had under natural lighting conditions. This application of illumination might suitably be termed directed-indirect lighting and its field is almost unlimited for interior use.

## A Landsman's Log Aboard the Battleship "North Dakota"—II

*(Concluded from page 391.)*

Philip, whose "Don't cheer, boys, the poor fellows are dying!" as it rang down from the bridge when the "Texas" drew up to one of the sunken Spanish cruisers after the Santiago fight, was one of the finest expressions of the spirit of the navy that ever became a classic. Times have changed since then, and people too. Certainly the navy has changed, and in nothing so greatly as in its gunnery. I crawled around the ship looking for broken metal, whose white fractures would show that they were recent and had been made by the "Delaware" in that day's firing. There they were—holes near the channel plate, where the shots had entered, and exit holes near the water line on the lee side of the ship, where they had left it. There must have been others—I had no time to look for them. Indeed, I was perfectly satisfied to find this much evidence that projectiles fired at these unprecedented ranges had struck the diminutive mark afforded by this little ship, whose freeboard in her sunken condition was not more than ten or twelve feet. The "Delaware," in hitting the "San Marcos" at eight to ten mile ranges, had done incomparably finer shooting than the whole fleet at Santiago, which made less than four per cent at a two-mile range.

Then it was "all aboard" for the "Delaware," and after another four or five miles of nautical gymnastics (the behavior of these steam cutters in the lumpy seas of the Chesapeake and on the southern drill grounds was something that must be seen and felt to be understood—our particular boat did everything on that trip but stand on its head and sit up on its stern), we boarded the "Delaware," to hear its gunnery officers and everybody else connected with the ship bewailing the fact, forsooth, that they had not done better shooting! To me the work, in view of the great range, had seemed to be truly wonderful. As I was merely a landsman, however, I had to be content to believe that they considered their shooting to have been indifferent, and that by giving more time between salvos for the spotter's directions to be plotted and sent to the gun stations, they could have greatly bettered the performances.

It is this setting of an exceedingly high standard—this determination to be satisfied with nothing short of the best possible results—that enables our ships to shoot accurately and swiftly at ranges that are not attempted in any other navy in the world. "The first salvo that lands will practically win the fight," is a statement that I heard frequently repeated during that two weeks' cruise with the Atlantic fleet; and I saw enough, that day, to satisfy me that, as matters stand, our ships would drop their shells upon an enemy long before he could hope to make any effective reply.

*(To be Continued.)*

## The Current Supplement

THE front page of our current SUPPLEMENT, No. 1869, shows a fine illustration of a rather remarkable bucket chain excavator at work in a Hungarian cement pit.—A peculiar amalgam which appears to consist of a mixture of mercury with the radicle ammonium, has been known since the days of Berzelius. Its true character has long been a matter of dispute, and is of interest as furnishing an apparent example of a compound radicle possessing true metallic properties. The subject of such synthetic metals is discussed by Prof. McCoy.—An article reproduced from *Nature* deals with the hydro-electric plants of Norway and their application to electro-chemistry.—A catalytic process for effecting the direct union of hydrogen and nitrogen to ammonia has been worked up by Prof. Haber. An account of this important development has been given by F. A. McDermott.—We have all of us at one time or another twanged the spokes of our bicycle to determine whether they were in proper condition. A similar but more elaborate test is now applied to the wires of aeroplanes, according to an invention of Capt. F. Largier, which is described and illustrated in the current issue.—A most interesting review of recent developments of astronomy is given by J. S. Plaskett.—An illustrated article deals with the varied uses of the royal palm, one of the most striking vegetable features of Cuba.—The fruit industry in the West has grown to gigantic dimensions. A single frost may cause vast losses. Prof. McAdie has published somewhat extensively on the subject of frost protection in fruit orchards. Some of his work, illustrated with photographs furnished by him, is reported in a brief article.—The article on caisson sickness is brought to its conclusion in a second installment.—Those interested in locomotive engineering will find valuable information in an article on a new fourteen-wheel express locomotive.—A high-speed cast-iron flywheel of remarkable design is described and illustrated in an article derived from *Power*.—The versatile genius of Swedenborg led him, among other things, to evolve some plans for a flying machine. This historical curiosity is reproduced from a publication of the Swedenborgian Association.

## Death of Eugene Ely

FLYING at the State Fair Grounds, Macon, Georgia, on the 19th of this month, Eugene Ely, in a Curtiss biplane, lost control of his machine and dashed to earth. As the machine neared the ground, Ely attempted to leap clear of the machinery; in this he was partially successful, but the impact was sufficient to crush him so badly that he died shortly afterward. Eugene Ely joined Glenn H. Curtiss in the summer of 1910. Last November he sprang into fame when he launched his aeroplane from the U. S. S. "Birmingham," and flew to shore, eight miles away. In January he reversed this feat by flying from shore to the armored cruiser "Pennsylvania," landing on a special platform built on the deck of the vessel. He was with the army aviation corps at San Antonio, Texas, where his work at scouting was notable.

## The Development of Spitzbergen

PRESS reports from Copenhagen state that the total export of coal from Spitzbergen this year will amount to 25 large cargoes, and it is expected that fully 100 will be exported next year. The political status of Spitzbergen is still undetermined, but it has been fully surveyed by the Norwegian government, which is also about to open a wireless station there, and it is evident that Norway will do its utmost to establish sovereignty over this far northern country. It is stated that the Norwegians have discovered new mineral deposits, the situation of which is kept secret.

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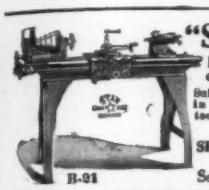

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# Correspondence

*[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]*

## A Correction

To the Editor of SCIENTIFIC AMERICAN:

In my article on the Diesel engine, on page 314, next to the last paragraph, the statement is made: "On the other hand, in an engine with eight cylinders, one cylinder may not become inoperative without affecting the power of the engine to a very great extent." The word *not* in this sentence is an error, as the point to be made was that an engine having as many cylinders might run with one cylinder inoperative without affecting the power, to any serious extent.

HAYNER H. GORDON.

October 7th, 1911.

## Roots in Sewer Pipes

To the Editor of SCIENTIFIC AMERICAN:

I noted with interest to-day the illustration and article on page 281 of the SCIENTIFIC AMERICAN, referring to roots in sewer pipes, and a shield to prevent their entrance. In passing, I should like to remark that so far as my experience goes, sewer pipes are cemented together, a "baby" or pad of cloth or burlap being dragged through by the mason to smooth the interior of the joints.

Returning to the roots, I wish to say that while quartermaster at Fort Assinniboine, Montana, I found a main sewer pipe clogged, and a basement flooded with sewage, one day. Upon digging up the pipe (it was about 10 feet down) it was found that a mass of fine, hair-like roots, bunched together, completely closed it. This pipe was 8 inches in diameter, but just at this point was a junction, below which the main was 10 inches in diameter, and this, too, was found almost entirely closed by root masses. In all, 36 feet of pipe (about equal portions of each size) were replaced as the roots could be cleared out only by breaking up the pipe, and pulling the masses of fibers out. The largest mass was about 6 feet long and 3 inches in diameter, and when washed out and dried, was very similar in appearance to a bunch of oakum. The pipe was of the best quality of glazed tile obtainable and the joints were tightly cemented; but these root-fibers had grown through the pipe at all points, and so thickly that fragments of the pipe in some cases seemed to support a thick growth of hair. The roots came, apparently, from some small cottonwoods planted as shade trees along the roadway, and the nearest were about 20 feet laterally from the pipe line. A friend of mine told me that he had had a similar trouble with eucalyptus roots in a California post, and had cured it by packing the pipes in salt. I therefore purchased all the coarse rock salt (not lump, but broken pieces) that could be obtained in the small neighboring town of Havre, Montana, and packed it about 3 inches thick below, on each side, and above the replaced pipe, completely inclosing it. In the dry soil of that country this mass of salt should not soon dissolve; and the earth immediately around the pipe would remain heavily "salted" for a long time to come. The cost was only a few cents per foot, and it is not easy to see how any roots could pass such a barrier.

Durham, N. H. G. W. EDGERLY.

## A Curious Meteor

DR. MAX WOLF, director of the observatory of Heidelberg, reports in *L'Astronomie*, that on the night of May 22nd, he observed a faint meteor moving from east to west across the constellation Aquila. Its diameter was about 15 minutes of arc. It passed rapidly over the star Gamma Aquilæ, and disappeared, leaving behind it a faint trail which vanished almost immediately. The remarkable feature of the observation was that the star Gamma remained invisible for fully 3½ seconds after the meteor and its train had disappeared. The obvious explanation is that the meteor left behind it a trail of opaque and non-luminous matter, dense enough to eclipse the star.


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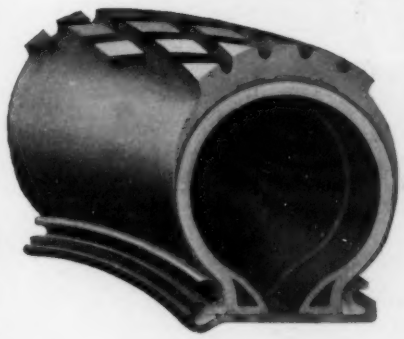

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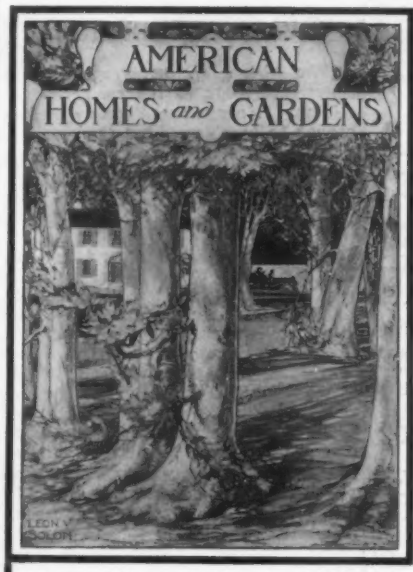


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